

中国-喜马拉雅特有属——蓝钟花属的分类修订*

TAXONOMIC REVISION OF THE SINO-HIMALAYAN GENUS *CYANANTHUS* (CAMPANULACEAE)

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Abstract *Cyananthus* Wallich ex Benth, the only genus of Campanulaceae with superior ovary, is revised to clarify infrageneric relationships and phylogeny of the genus. Evidence obtained from the comparative gross morphology, anatomy, palynology, and karyomorphology recommends a new infrageneric classification of the genus, recognizing 23 species, belonging to two subgenera, four sections and four subsections. One subgenus (Subgen. *Micranthus*), one section (Sect. *Suffruticulosi*) and two subsections (Subsect. *Flavi* and Subsect. *Lichiangenses*) are described as new taxa. New combinations at sectional (Sect. *Annui*) and subsectional (Subsect. *Stenolobi*) ranks are also proposed. The genus *Cyananthus* is strictly distributed in the high mountains of China (Xizang, Yunnan and Sichuan), extending to Bhutan, Nepal and India (Kumaon-Garhwal, Assam and Sikkim), with altitudinal ranges from 2500~5300 m. It is observed that 13 species are endemic to SW China and only three species are endemic to the Himalayas (two species in Nepal and one to NW India). It is evident that *Cyananthus* is one of the most primitive genera of Campanulaceae and within the genus, subgenus *Cyananthus* (Sect. *Stenolobi*) is more primitive than the subgenus *Micranthus*. It is also suggested that SW China (most probably Yunnan) is the center of origin of *Cyananthus*, considering the occurrence of as many as 20 species of *Cyananthus*, representing several primitive taxa and many endemic species.

Key words *Cyananthus*; Revision; Sino-Himalayan

The Sino-Himalayan genus *Cyananthus* Wallich ex Benth is one of the critical genera in the family Campanulaceae. It is the only genus with completely superior ovary and has rather primitive type of pollen grains. Moreover, the flowers are tubular or funnel-shaped, the anthers are imperfectly connate around the style, and the stigma is 4- or 5-parted. Due to such unique characters, the genus was originally placed in the Polemoniaceae. It was also treated by Agardh (1858) as a monotypic genus of the family Cyananthaceae. The genus was later placed in the Campanulaceae, a position now accepted by almost all taxonomists. Due to peculiar features among the campanulaceous genera, *Cyananthus* occupies an isolated posi-

tion within the family and is generally regarded as the most primitive one.

To clarify the infrageneric relationships and systematic position of the genus within the Campanulaceae, a taxonomic revision of *Cyananthus* is undertaken. Evidence obtained from the comparative gross morphology, anatomy, palynology, and karyomorphology recommends a new classification of the genus. The present taxonomic treatment is based on herbarium specimens and, when available, living plants and preserved materials. Types of almost all taxa have been examined. Majority of the taxa are lectotypified here.

A revision of *Cyananthus* is presented, and two subgenera are recognized. The subgenus *Cyananthus* (21 spp.) is characterized by having large, peduncled, funnel-shaped to tubular, pentamerous flowers, whereas the subgenus *Micranthus* (two spp.) is characterized by having small, sessile, sub-campanulate, tetramerous flowers. The four sections recognized here (Sect. *Stenolobi*, Sect. *Suffruticulosi*, Sect. *Cyananthus*, and Sect. *Annui*, all of which belong to Subgen. *Cyananthus*) are morphologically and geographically distinct. Sect. *Stenolobi* and Sect. *Annui* each is subdivided into two subsections, the former including two series. The section *Cyananthus* is also subdivided into two series. The infrageneric classification is based on life form, nature of calyx indumentum, corolla color, and length and shape of corolla lobes.

Cyananthus Wall. ex Benth. in Royle, Ill. Bot. Himal. Mts. 309. 1836; Wall. Catal. 40. 1829, nom. nud., nom. cons. prop. (—*Cyananthus* Raf., Anal. Nat. 192. 1815. = *Cyanus* Miller (Asteraceae); *Cyananthus* Griff., Notul. 4. 154. 1854. = *Stauranthera* Benth. (Gesneriaceae); *Cyananthus* Miers in Wall. Cat. n. 9007-8. 1849. = *Burmattia* Linn. (Burmattiaceae)).

Lectotype: *C. lobatus* Wall. ex Benth.

Cyananthus Wall. ex Benth. (Campanulaceae) is an illegitimate later homonym of the validly published but nomenclaturally superfluous and illegitimate replacement name *Cyananthus* Raf. for *Cyanus* Miller (Asteraceae), a taxonomic synonym of *Centaurea* L. Another, later homonyms, *Cyananthus* Miers, a synonym of *Burmattia*, and *Cyananthus* Griff., a synonym of *Stauranthera*, belong to the Burmattiaceae and Gesneriaceae respectively.

The lectotype of *Cyananthus* Wall. ex Benth. is *C. lobatus* Wall. ex Benth. (Reveal & Hoogland, 1991), because it is the best known, most widely distributed, first introduced and easiest to grow, certainly more than the other (first) species listed in the protologue, *C. integer* ("integra").

The generic name has been consistently accepted since proposed and appeared in standard references (Cronquist, 1988; Takhtajan, 1987; Hutchinson, 1973; Willis, 1973). Surprisingly, the generic name was overlooked by ING (Farr *et al.* 1979).

Annual or perennial herbs with many short branches from caudex; caudex branches imbricate-scaly at apex. Stems prostrate, simple or branched in annual species; nodes unilacunar; internodes with a continuous cylinder of xylem and phloem, vessel with elements simple

or rarely scalariform perforations (*C. hookeri*). Leaves exstipulate, small, alternate, petioled; petiole with an arc-shaped vascular strand, laticiferous canals usually present in phloem cells; stomata anomocytic; leaf blades simple, entire or crenate-undulate or lobed, pale glaucous or densely pubescent abaxially. Flowers very frequently showy, blue, rarely yellow or white, terminal, solitary, less frequently in cymes, short-pedunculate, rarely sessile. Calyx pentamerous, sometimes tri- or tetramerous (annual species), persistent; lobes valvate, connate, usually adnate to corolla and androecium to form a hypanthium adnate to ovary. Corolla funnel-shaped or tubular, longer than calyx tube; lobes 5, valvate; corolla hairy at throat. Stamens 5, together with the corolla, attached to base of ovary; filaments slender; anthers ovate, imperfectly connate around style. Pollen (6) 7~9 (~12)-colpate, oblate-spheroid to broadly ellipsoid, minutely spinulose, perforate. Ovary conical, 3~5-locular, as long as calyx. Stigma somewhat conical or clavate, pubescent outside, 3~5-lobed; lobes short, erect, recurved at length; locules circular, flat at base; ovules numerous, adnate to axile placentae. Capsule conical, thick, occasionally inflated, apex 3~5-valved. Seeds numerous, minute, oblong to broadly ellipsoid, dark brown or brown; reticulate or rarely striate; ribs broad in perennial species, narrower in annuals. Chromosome numbers $2n = 14, 28$; rarely $2n = 24$ (*C. hookeri*). Distributed mainly in temperate to alpine grasslands of the Himalayas and SW China.

KEY TO INFRAGENERIC TAXA

1. Flowers peduncled, >1.5 cm long, pentamerous or rarely tetramerous; corolla funnel-shaped or tubular Subgen. 1. **Cyananthus**
 2. Corolla funnel-shaped, lobed up to one third of its length, lobes broader than long; calyx densely covered with black or brown stiff hairs.
 3. Plants suffruticulose, with a large caudex; stems with persistent scaly leaves at base; corolla narrowly funnel-shaped; calyx with brown hairs Sect. 2. **Suffruticulosi**
 3. Plant not suffruticulose, with a prominent caudex; corolla broadly funnel-shaped; calyx with black hairs Sect. 3. **Cyananthus**
 2. Corolla tubular, deeply lobed, lobes 2~3 times longer than broad; calyx sparsely covered with soft, brown hairs.
 4. Plants perennial, with a small caudex; flowers solitary or few, long, tubular ... Sect. 1. **Stenolobi**
 5. Calyx hairy (rarely glaucous); corolla long, tubular, blue Subsect. 1. **Stenolobi**
 5. Calyx glabrous; corolla broad, sub-infundibular, yellow or white Subsect. 2. **Perennes**
 4. Plants annual; stems much branched; flowers several, small, sub-tubular Sect. 4. **Annui**
 6. Flowers pentamerous, yellow; calyx large (up to 1.7 cm long); hairs stiff, with glands at base; corolla shallowly lobed Subsect. 1. **Lichiangenses**
 6. Flowers rarely tetramerous, blue; calyx small (< 1.0 cm long), hairs soft, without gland at base; corolla deeply lobed Subsect. 2. **Annui**
 1. Flowers sessile, <1.2 cm long, tetramerous; corolla subcampanulate Subgen. 2. **Micranthus**

KEY TO THE SPECIES

1. Plants annual; stems much branched; flowers several.
 2. Plants < 15 cm high; leaves short petioled, ovate-lanceolate; flowers sessile, < 1.2 cm long, tetramerous, corolla sub-campanulate, blue.
 3. Plants densely hairy; leaves ovate-lanceolate, serrate; calyx densely covered with stiff whitish hairs; corolla long (> 1.0 cm); stigma swollen at base 23. *C. hookeri*
 3. Plants glabrous; leaves obovate, undulate; calyx sparsely hairy with soft brown hairs; corolla smaller (< 1.0 cm); stigma filamentous 22. *C. cronquistii*
 2. Plants > 20 cm high; leaves long-petioled, suborbicular; flowers pedunculate, larger, > 1.5 cm long, pentamerous, rarely imperfectly tetramerous; corolla tubular, blue or yellow.
 4. Flowers rarely imperfectly tetramerous, < 1.5 cm long; calyx inflated, hairs not glandular at base; corolla blue, narrowly tubular, deeply lobed.
 5. Flowers solitary at apex of branches, calyx shortly lobed, sharply inflated, acute at apex 20. *C. inflatus*
 5. Flowers in clusters of 3 or 4 at apex; calyx deeply lobed, scarcely inflated, nearly obtuse at apex 21. *C. fasciculatus*
 4. Flowers perfectly pentamerous, > 1.5 cm long; calyx not inflated, hairs glandular at base; corolla yellow, cylindrical, shallowly lobed 19. *C. lichiangensis*
1. Plants perennial, with a distinct caudex, stems nearly unbranched; flowers solitary, rarely few.
 6. Calyx and peduncle densely covered with black to dark brown hairs; corolla blue, lobed to one third of its length; capsule equal to calyx.
 7. Plants with a large caudex and two types of branches; calyx with black and brown hairs; corolla sub-tubular and lobed to at least one third of its length.
 8. Plants densely hairy throughout; leaves ovate, silky tomentose 11. *C. wardii*
 8. Plants sparsely hairy; leaves lanceolate, sparsely hairy, margins long ciliate ... 10. *C. sherriffii*
 7. Plants with a small caudex, branches uniform; calyx black hirsute; corolla funnel-shaped, lobed to one third.
 9. Peduncle > 1.5 cm long, corolla very shortly lobed, throat glabrous.
 10. Leaves sessile, oblong, entire; peduncle 1.3~3.5 cm long, black hirsute 17. *C. pedunculatus*
 10. Leaves subsessile, broadly ovate, undulate-crenate; peduncle 2.5~8.5 cm long, glabrescent 18. *C. himalaicus*
 9. Peduncle < 1.5 cm long (except one sp.); corolla lobed to one third, throat hairy.
 11. Leaves deeply 3~5-lobed; flowers distinctly peduncled.
 12. Peduncle 1.5~2 cm long; calyx deeply lobed, spreading, corolla 1.5 cm long 16. *C. hayanus*
 12. Peduncle < 1.5 cm long; calyx shallowly lobed, not spreading; corolla > 2.0 cm long 15. *C. lobatus*
 11. Leaves entire or crenate; flowers subsessile.
 13. Leaves sessile, cordate, clasping stem, leaves larger in fertile branches 14. *C. cordifolius*

13. Leaves petioled, lanceolate, uniform.
14. Leaves elliptic lanceolate, semi-serrate 13. *C. integer*
14. Leaves linear lanceolate, entire 12. *C. microphyllus*
6. Calyx and peduncle sparsely hairy with soft, light brown hairs or glabrous; corolla blue or yellow, deeply lobed; capsule longer than calyx.
15. Calyx tubular, hairy or rarely glabrous; corolla blue, tubular.
16. Plants hairy throughout; calyx hairy.
17. Stems semi-woody, densely tomentose, flowers many on short branches 1. *C. longiflorus*
17. Stems herbaceous, moderately hairy, flowers solitary.
18. Plants hairy throughout, petiole < 2 mm. long, leaf blade ovate lanceolate ... 5. *C. incanus*
18. Plants sparsely hairy, petiole > 2 mm long, leaf blade suborbicular or obovate.
19. Plants glabrescent, flowers > 3.0 cm long 2. *C. formosus*
19. Plants moderately hairy; flowers < 3.0 cm long.
20. Calyx pilose, leaves entire. 3. *C. pilosus*
20. Calyx glabrescent, leaves crenate-toothed 4. *C. delavayi*
16. Plants glabrescent; calyx glabrous except for apex.
21. Peduncle 1~3 cm long, calyx shallowly lobed, glabrous; leaves lanceolate, moderately pubescent
..... 6. *C. dolichosceles*
21. Peduncle < 1.0 cm long; calyx deeply lobed; leaves obovate, glaucous above ... 7. *C. leiocalyx*
15. Calyx cylindrical, glabrous; corolla yellow, sub-infundibular.
22. Peduncle > 1.5 cm long; calyx tubular, glaucous; leaves elliptic, pubescent 9. *C. flavus*
22. Peduncle < 1.0 cm long; calyx cylindrical, glabrous; leaves obovate, minutely setose below
..... 8. *C. macrocalyx*

Subgen. 1. *Cyananthus*

Perennial or annual herbs. Flowers peduncled, solitary, terminal, pentamerous, more or less large and showy. Calyx hairy with soft, short to long black or brown hairs or glabrous. Stamens, stigma, ovary and capsule 5-parted. Pollen oblate-spheroid to spheroid or ellipsoid, (6~) 7~9 (~10)-colpate, with or without polar caps, furrow of colpi broad, apocolpium long; ornamented with more or less distinct perforations and spinules. Seeds large, sculpture reticulate-striate, rarely striate, ribs broad. Secondary xylem in stem with simple perforations. Chromosomes: $2n=14, 28$.

Sect. 1. *Stenolobi* Franch. in J. Bot. (Paris) 1: 258. 1887; C. Marq. in Kew Bull. 1924: 242. 1924; Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2):13. 1983, p.p.

Type: *Cyananthus incanus* Hook. f. & Thomson

Perennial, nearly stout herbs, with more or less developed caudex. Flowers peduncled, solitary or at the apex of lateral branches. Calyx long, tubular, covered with light brown soft hairs, rarely glabrous, sparsely hairy at apex. Corolla long, tubular, 3~5 times longer than calyx, deeply cleft; lobes narrower than long; petals blue or yellow; capsules longer than calyx, changing texture at maturity. Pollen 7~9-colpate, broadly ellipsoid, spinules small,

perforations small to medium-sized. Seeds reticulate-striate, rarely striate, ribs broad; radial wall in the exotesta with constrictions and pores.

Distribution W & Central Himalayas, SW China.

Subsect. 1. *Stenolobi*—Subsect. *Perennes* Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 13. 1983, p.p., excl. typo.

Herbaceous or semi-woody; flowers solitary, rarely a few at apices of lateral branches, tubular, blue; calyx hairy, slightly changed in fruiting.

1. *Cyananthus longiflorus* Franch. in J. Bot. (Paris) 1: 280. 1887; C. Marq. in Kew Bull. 6: 255. 1924; Cowan, New Fl. Silva 10: 183. 1938; Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 23. 1983; D. Y. Hong & L. M. Ma in Acta Phytotax. Sin. 29: 46. 1991. — *C. argenteus* C. Marq. in Kew Bull. 1924: 253. 1924; D. Y. Hong & L. M. Ma in Acta Phytotax. Sin. 29: 46. 1991. (Yunnan, China: Mount. Tsang, near Tali, 3600 m, 1914-10-16, C. Schneider 2774 (Lectotype (here designated)! K). — *C. obtusilobus* C. Marq. in Kew Bull. 1924: 254. 1924; Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 23. 1983. (Fig. 1)

Yunnan, China: in monte Tsang-chan, supra Tali, 1884-09-26, M. Delavay 138 (lectotype (here designated)! P; isolectotypes! E, GH, K, LE, NY).

Perennial stout herbs; caudex thick, woody, with well developed succulent roots (like a bulb). Stems 15~25 cm, covered with minute scales at base; shortly branched, minutely setose. Leaves lanceolate, 1~1.2×0.5 cm, acute at apex, attenuate at base, glabrous or sparsely setulose above, minutely setose with whitish fragile dense hairs below, margin entire and revolute. Flowers subsessile, solitary terminal or several at the apex of main and short lateral branches, resembling a pseudo-raceme. Calyx cylindrical, 1.2~1.5 cm long, hispid, divided up to 1/3 of the calyx, teeth lanceolate, triangular, acuminate. Corolla blue, tubular, 4~5 cm long, divided to the middle; lobes oblong and erect; throat covered with long hairs. Capsule conical, acuminate, exerting the calyx.

Distribution China (Yunnan). Alt. 2800~4600 m.

Specimens examined CHINA: Yunnan: 1885-10-22, M. Delavay, s. n. (syntype! P); ibid., T. T. Yu 5052 (GH), 15621 (GH); Chien chuan-Mekong divide, 3600 m, G. Forrest 22214 (W, US); Chungtien, 3400 m, C. Schneider 2380 (GH, K, US); Hee chan men, 1884-09-03, M. Delavay 96 (syntype! P; isosyntypes! E, K, LE); ibid., 2800 m, 1887-09-09, M. Delavay s. n. (P); ibid., 1889-10-28, M. Delavay, s. n. (P); Lankong, 1884-09, M. Delavay 96 quat. (syntype, P; isosyntype! K); ibid., 2800 m, 1885-10-22, M. Delavay, s. n. (P); Lichiang range, R. C. Ching 21397 (GH), 21684 (GH), 30608 (GH); ibid., G. Forrest 3045 (E), 6516 (BM, E); ibid., 3500 m, G. Forrest 11399 (E, K), 4600 m, G. Forrest 22474 (K, US, W); ibid., 2800 m, H. Handel-Mazzetti 3760 (W); ibid., H. Mc Laren 228 (BM), 247 (BM); ibid., 2900 m, C. Schneider 3789 (GH, K, US); ibid., 3000 m, T. T. Yu 15621 (PE); Tali, 3300~4000 m, G. Forrest 3849

Fig. 1 *Cyananthus longiflorus* (Isolectotype, LE)Fig. 2 *Cyananthus formosus* (Holotype, E)

(E), 6867(BM, E, K,), 27995(E); *ibid.*, Mc Laren 'D' 247(E); *ibid.*, 2800 m, C. Schneider 2753(isotype of *C. obtusilobus* Marq., GH, K); *ibid.*, 3500 m, C. Schneider 2774(GH); Talifu, 3500 m, C. Schneider 2514(GH, US); *ibid.*, 3500 m, C. Schneider 2774(W); Likiang, 3200 m, J. Rock 6172(BM, US), 7789(E, US), 10756(K, US), 10868(US); between Likiang and Talifu, J. Rock 6545(P, NY, US).

2. *Cyananthus formosus* Diels in Notes Roy. Bot. Gard. Edinb. 5: 172. 1912; C. Marq. in Kew Bull. 1924: 250. 1924; Cowan, New Fl. Silva 10: 182. 1938; Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 13. 1983; D. Y. Hong & L. M. Ma in Acta Phytotax. Sin. 29: 43. 1991 — *C. chungdianensis* C. Y. Wu, Report on Studies of Trop. & Subtrop. Region of Yunnan 1: 83. 1965, syn. nov. (Fig. 2)

Yunnan, China: E flank of the Lichiang range, 3200~3600 m, 1906-08, G. Forrest 2726(holotype! E; isotype! P).

Perennial decumbent weak herbs; caudex thick, woody and long. Stems 20~40 cm, covered with minute scales at base, unbranched, slender, glabrous, purplish. Leaves long petioled, petiole 1~1.5 cm long, winged; suborbicular, broader than long, 0.4~0.6×0.6

~0.8 cm, sharply attenuate at base, nearly glabrous above, covered with white silky hairs below, margin undulate and revolute. Flowers peduncled, solitary, terminal; peduncle 0.4~0.7 cm long, glabrous. Calyx cylindrical, 1.0~1.3 cm long, hispid, divided up to 1/3 of its length, teeth lanceolate, triangular, acute. Corolla dark blue or purplish blue, tubular, 3.5~4.5 cm long, showy, divided up to the middle; lobes oblong, erect, setulose; throat hairy. Capsule conical, acuminate, exerting the calyx.

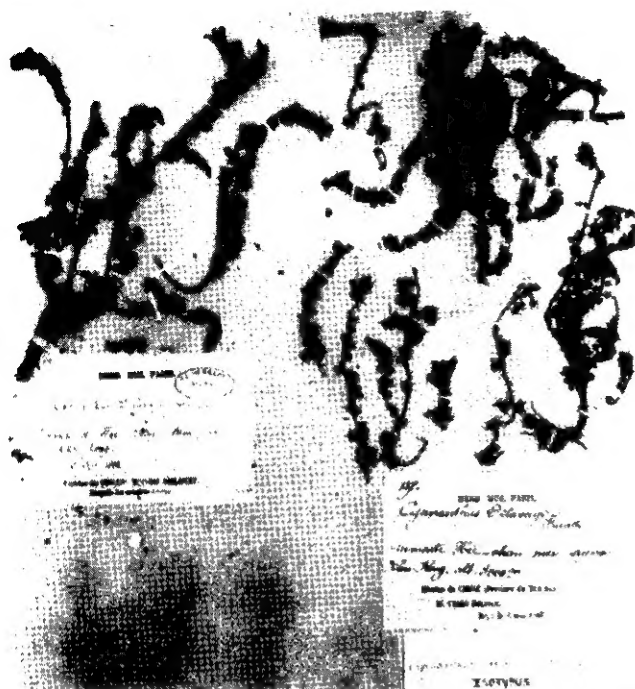
Distribution China(Yunnan, Sichuan). Alt. 2800~4800 m.

Specimens examined CIHNA: Yunnan: Chien-Chuan Mekong divide, 4300 m, G. Forrest 23126(US); *ibid.*, 4000~4600 m, G. Forrest 23175(E, K, P, US, W); G. Forrest 23196(E, K); Chungtien, K. M. Feng 2313(GH); *ibid.*, 4600 m, J. Rock 17257(E, MO, NY, P, US, W); *ibid.*, 3600~3800 m, C. Schneider 2066(GH, K, US); *ibid.*, 3500 m, T. T. Yu 12651(PE); Lichiang, R. C. Ching 30532(GH), G. Forrest 2726(P), 6245(E), 6665(BM, E), H. Mazzetti 3759(W), H. Mc Laren 153(BM, E), J. Rock 5267(E, GH, NY, US); *ibid.*, 4600 m, J. Rock 6102(BM, K, LE, NY, P, US), J. Rock 6245(BM, MO, P); *ibid.*, 3600 m, J. Rock 10663(US), J. Rock 10677(US), 24919(BM, E, GH, K, MO, US); *ibid.*, 3600~3800 m, C. Schneider 2066(GH, K, US), 4000 m, C. Schneider 3473(GH, K, US); *ibid.*, R. C. Ching 30972(PE); Lichiang, Nguluko, 2800 m, T. T. Yu 15836(PE); between Lichiang & Young-Ning, 3850 m, J. Rock 17334(K, P, W); Mekong-Yangtze divide, 4000 m, G. Forrest 13013(BM, E), 4600 m, G. Forrest 13223(E). Sichuan: Muli, 4300 m, H. Handel-Mazzetti 7320(W); *ibid.*, 4460 m, J. Rock 18308(GH, US), J. Rock 24469(BM, E, GH, K, NY, US); *ibid.*, 3600 m, T. T. Yu 7789(PE), K. Ward 4730(E).

3. *Cyananthus delavayi* Franch. in J. Bot. (Paris) 1: 280. 1887; C. Marq. in Kew Bull. 1924: 250. 1924; Cowan, New Fl. Silva 10: 182. 1938; Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 15. 1983; D. Y. Hong & L. M. Ma in Acta Phytotax. Sin. 29: 42. 1991—*C. barbatus* Franch. in Bull. Soc. Bot. (Paris) 7: 9. 1885, non Edgew. 1846.—*C. microrhombeus* C. Y. Wu, Report on Studies of Trop. & Subtrop. Region of Yunnan 1: 85. 1965; Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 14. 1983. (Fig. 3)

Yunnan, China: above Lankong, 1884-10-09, M. Delavay 137(lectotype(here designated)! P; isoelectotypes! K, LE).

Perennial decumbent herbs; caudex thick, woody with strong roots. Stems 10~20 cm; shortly scaly at base, unbranched, often shortly branched, slender, pilose. Leaves long-petioled, petiole 0.6~1 cm long, winged, ciliate; suborbiculate, 0.3~0.6×0.4~0.6 cm, sharply attenuate at base, obtuse at apex, glabrescens above, covered with white dense hairs below, margin undulate. Flowers shortly pedunculate, solitary, terminal, rarely at the apex of lateral branches; peduncle 0.4~0.6 cm, sparsely hairy. Calyx cylindrical, 0.7~0.8 cm long, glabrescent to minutely pubescent, scarcely divided up to 1/3 of its length, teeth trian-

Fig. 3 *Cyananthus delavayi* (Isotype, LE)Fig. 4 *Cyananthus pilosus* (Holotype, K)

gular-lanceolate, ciliate, acute. Corolla blue, tubular, 2.3~2.8 cm long, divided up to the middle; lobes oblong, setulose; hairy at throat. Fruit bearing calyx enlarged, 1.2 cm long, globose, shortly attenuate at base. Capsule conical, acute.

Distribution China (Yunnan, Sichuan). 2800~4000 m.

Specimens examined CHINA: Yunnan: A. Henry 794 (K), J. Cavalerie 7426 (E, K), F. Ducloux 319 (E), 697 (P), 2289 (K, P), E. Maire 2342 (E, K, US); Chungtien, K. M. Feng 2319 (GH); *ibid.*, 4600 m, G. Forrest 41 (E), 4000 m, G. Forrest 323 (E), 3500 m, H. Handel-Mazzetti 4615 (W), 3300 m, K. M. Feng 1979 (GH), 3100 m, T. T. Yu 12621 (PE), 3150 m, T. T. Yu 13908 (BM, GH); Haba snow range, K. M. Feng 2355 (GH); Hee chan men (Lankong), 1884-09-03, M. Delavay 96 ter (syntype! P; isosyntypes! K, E); *ibid.*, M. Delavay 96 bis (P); *ibid.*, 3000 m, M. Delavay 299 (syntype! P), 3000 m, M. Delavay 137 (P), 3000 m, 1887-09-09, M. Delavay, s. n. (K, NY); Lichiang, H. Mc Laren 274B (BM, E); between Lichiang and Tali-fu, J. Rock 6302 (US); between Sung gueh & Tonghuan, 3500 m, C. Schneider 2692 (K).

Sichuan: Hsi-chang Hsien, 2800 ~ 3000 m, T. T. Yu 1285 (GH); Muli, 3800 m, H. Handel-Mazzetti 7220 (W); ibid., 4300 m, J. Rock 16931 (E, US); between Yenyuen and Yalung River, 3000 ~ 3640 m, H. Handel-Mazzetti 5388 (E, K, US, W); Yen-Yuang, 2800 m, T. T. Yu 1741 (GH); ibid., 3850 m, Qinghai-Tibet Brigador 12770 (PE).

4. **Cyananthus pilosus** (C. Marq.) K. Shrestha, stat. et comb. nov. — *C. macrocalyx* Franch. var. *pilosus* C. Marq. in Kew Bull. 1924: 251. 1924; Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 18. 1983. (Fig. 4)

Yunnan, China: Tsekon, 1905-06, P. Monbeig, s. n. (holotype! K; isotype! K).

Low perennial decumbent herbs; caudex slender. Stems 8 ~ 12 cm, covered with few short scales at base; unbranched, slender pubescent. Leaves long petioled, petiole 0.3 ~ 0.5 cm, winged, ciliate; ovate-rhomboid, 0.3 ~ 0.5 × 0.3 ~ 0.4 cm, shaply attenuate at base, obtuse at apex, glabrous above, densely tomentose below, margin undulate and revolute. Flowers peduncled, solitary, terminal; peduncle 0.2 ~ 1.2 cm, slightly pubescent. Calyx cylindrical to subcampanulate, 0.9 ~ 1.1 cm long, yellowish hirsute, divided to one third to nearly half of its length; teeth triangular lanceolate, subacute. Corolla blue to bright violet, cylindrical, 2.5 ~ 3.0 cm long, divided to one third of its length; lobes oblong ovate, obtuse, mucronate at apex, villous with violet hairs at throat. Capsule not seen.

Distribution China (Xizang, Yunnan). Alt. 3000 ~ 4200 m.

Specimens examined CHINA: Xizang: Valley of the Seinghku, 3200 ~ 3600 m, F. K. Ward 7486 (E, K). Yunnan: Bei ma shan, Mekong-Yangtze divide, G. Forrest 13279 (BM, E).

5. **Cyananthus incanus** Hook. f. & Thomson in J. Linn. Soc. London (Bot.) 2: 20. 1858; C. B. Clarke in Hook. f., Fl. Brit. Ind. 3: 434. 1881; Franch. in J. Bot. (Paris) 1: 279. 1887; C. Marq. in Kew Bull. 1924: 252. 1924; Hara, Enum. Fl. Pl. Nepal 3: 51. 1982; Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 19. 1983; D. Y. Hong & L. M. Ma in Acta Phytotax. Sin. 29: 44. 1991.

E Himalaya: Sikkim, 3600 ~ 3900 m, J. Hooker, s. n. (holotype! K; isotypes! FI, LE, NY, P, W).

KEY TO THE SUBSPECIES

1. Stems and calyx hairy.
 2. Leaves < 1 cm, short-petioled, elliptic, crenate subsp. **incanus**
 2. Leaves > 1 cm, long-petioled, lanceolate, entire subsp. **petiolatus**
1. Stems moderately pubescent, calyx glabrous subsp. **orientalis**

A low spreading perennial; caudex stout. Stems 8 ~ 20 cm. Leaves lanceolate, entire or undulate, softly white hairy. Flowers solitary, terminal, azure-blue. Calyx lobed to half way or less, lobes 8 ~ 10 mm, usually ciliate. Corolla funnel-shaped, 2 ~ 2.5 cm across, white villous at throat, tube about 1.5 cm long; lobes spreading, oblong, acute at apex. Capsule about 8 mm long, surrounded by the enlarged calyx.

a. *Cyananthus incanus* subsp. *incanus*——*Cyananthus incanus* var. *trichocalyx* Franch. in J. Bot. (Paris) 1: 287. 1887. (Fig. 5)



Fig. 5 *Cyananthus incanus* (Holotype, K)

Low herbs. Stems 10~20 cm, enclosed with short scales at base, densely hoary tomentose. Leaves crowded, short-petioled, petiole winged; ovate-elliptic lanceolate, 0.5~0.7 cm×0.3~0.4 cm; acute at apex, pubescent, margin sinuate, crenate and revolute. Flowers short-peduncled, suberect. Calyx cylindric, <1.0 cm long, hoary or brown tomentose. Corolla blue, tubular, <2.5 cm long, lobed up to the middle.

Distribution Nepal, India (Sikkim), Bhutan, China (Xizang, Sichuan, Qinghai). Alt. 3700~5200 m.

Specimens examined

NEPAL: W Nepal: Jumla, Chakhure lekh, 3300 m, Manandhar & Joshi 6637 (KATH); Mahagunj khola, Grey Wilson & Philips 493 (BM, K). Central Nepal: Mustang, Marche, 4250 m, K.

Shrestha & Bista 2479 (KATH); Manang, Thorang Pass, 5220 m, N. P. Manandhar 10132 (KATH); Langtang, 3900 m, Dobremez 534 (BM); Above Kyanjin, 3700 m, D. H. Nicolson 2577 (KATH, US); Dolakha district, Nagaon to Chobuk, 4200 m, K. Rajbhandari & B. Roy 1847 (KATH). E Nepal: Lamni Nama, Phujeng, 4200~4800 m, H. Ohashi *et al.* 770854 (BM); Mount Everest, 4300 m, in 1992, A. Wollaston 348 (K). SIKKIM: Lonok, 4750 m, Smith & Cave 2076 (LE); ibid., F. Younghusband 202 (K); Inapokhari, 4000 m, Dr. King's collector, s. n. (CAL); Alp. Sikkim, Elwes, s. n. (LE). BHUTAN: Timpu, 3600 m, Bowes Lyon 5094 (BM); Pomu la, 3720 m, Ramesh Bedi 608 (K); Laya, Upper Mo chu, 4000 m, Ludlow, Sherriff & Hicks 17346 (GH); Tsampa, Tolegang, 4250~4750 m, Ludlow, Sherriff & Hicks 19732 (BM, W). CHINA: Xizang: Nagong, 4600 m, F. K. Ward 10661 (BM); Phari, G. King 460 (K); Yatung, 3500 m, Ludlow & Sherriff 10034 (BM).

b. *Cyananthus incanus* subsp. *petiolatus* (Franch.) D. Y. Hong & L. M. Ma in Acta Phytotax. Sin. 29: 44. 1991. — *C. petiolatus* Franch. in Bull. Soc. Phil. Paris, 8: 147. 1891. — *C. neglectus* C. Marq. in Curtis's Bot. Mag. 147: tab. 8909. 1938. — *C. pilifolius* C. Y. Wu, Report on Studies of Trop. & Subtrop. Region of Yunnan 1: 87. 1965. (Fig. 6)

Sichuan, China: Tachienlu, M. Soulie, s. n. (holotype! P; isotypes! LE, P).

A decumbent herb, stems 12~20 cm high, shortly hispid. Leaves long-petioled, linear-lanceolate, acute at apex, shortly pilose on both sides. Flowers peduncled, peduncle 0.5~1.0 cm long. Calyx covered with adpressed whitish hairs, lobed up to the middle; lobes lanceolate, obtuse at apex. Corolla twice longer than calyx, lobes oblong, densely hairy inside.

Distribution China (Sichuan).
Alt. 2700~4900 m.

Specimens examined CHINA: Sichuan: Tongolo, Kaila, R. Soulie 2798 (GH, K, P, US), 2803 (P); S Muli, 3900 m, T. T. Yu 7779 (PE); Tachien lu, R. Mussot 249 (P); 250 (P).

c. *Cyananthus incanus* subsp. *orientalis* K. Shrestha, subsp. nov.

(— *C. incanus* var. *parvus* C. Marq. in Kew Bull. 1924: 252. 1924. — *C. incanus* var. *decumbens* Y. S. Lian in Acta Phytotax. Sin. 17: 122. 1979.) (Fig. 7)

Nepal: Makalu, Upper Barun Valley, 4950 m, 1972-09-20, T. Wraber 238 (holotype! BM; isotypes! E, LE).

Subspecies nostra a *C. incano* subsp. *incano* et subsp. *petiolato* caulibus foliisque modice pilosis necnon calyce glabro differt.

Dwarf herbs. Stems < 12 cm, moderately hairy. Leaves short-petioled, broadly ovate lanceolate, 0.6~0.9 cm × 0.3~0.5 cm; acute at apex, moderately pubescent, margin crenate. Flowers shortly peduncled. Calyx cylindric, < 0.8 cm long, hoary light brown tomentose.



Fig. 6 *Cyananthus incanus* subsp. *petiolatus* (Holotype, P)



Fig. 7 *Cyananthus incanus* subsp. *orientalis* (Holotype, BM)

Fig. 8 *Cyananthus dolichosceles* (Isotype, BM)

tose. Corolla blue, tubular, spreading, 2.3~2.8 cm long, lobed up to the middle. Capsule subglobose, exceeding the calyx. Shape of calyx much changed in maturity.

Distribution E Nepal, India (Sikkim), Bhutan, China (Xizang). Alt. 4000~5000 m.

Specimens examined

NEPAL: Bheding, 4000 ~ 4300 m, Capt. Lal Dhwoj 290 (BM).

SIKKIM: Bikbary Valley, 4600 m, Starling *et al.* 516(E, K); Kalaru, 5250 m, R. Lepcha 426

(E). BHUTAN: between Kangla & Pu la, 4000 m, Ludlow, Sherriff & Hicks 21366 (US); Thimpu, 3960 m, Bigger

3029 (E); Tolegang, Tsampa, 4300 ~ 4700 m, 1949-09-10, Ludlow, Sherriff & Hicks 19732 (BM, W). CHINA: Xizang: Chamdo, Riwoche (96°30'N, 31°25'E), W. Rockhill 1892; W Shigetse, 4300 m, C. Cutting & A. Vernay 124(K); Chumbi, La-loong, Dr. King's collector 588 (CAL); Sanga, Cholong, 4000 ~ 4250 m, 1936-09-21, Ludlow & Sherriff 2593 (BM); Lhasa, 4300 m, 1939-07, H. E. Richardson 243 (BM); Pasum Tse, Komngbo, 3800 m, Lud-

6. **Cyananthus dolichosceles** C. Marq. in Kew Bull. 1924: 250. 1924; Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 19. 1983; D. Y. Hong & L. M. Ma in Acta Phytotax. Sin. 29: 45. 1991.

Sichuan, China: 2700~3200 m, 1903-07, E. Wilson 3983 (holotype! K; isotypes! BM!, GH, P). (Fig. 8)

Procumbent or ascending herbs. Root stock woody, but not thick. Stems 7~15 cm; unbranched, moderately pubescent; basal scaly leaves rarely submembranous and entire. Leaves subsessile, lanceolate, $0.9 \sim 1.2 \times 0.3 \sim 0.4$ cm; moderately white-pilose on both sides; margin crenate, revolute. Flowers long-peduncled, solitary, terminal; peduncle 1~2.5 cm long, minutely pubescent. Calyx sub-cylindrical, 1.0~1.4 long, almost glabrous, scarcely divided up to 1/3 of its length, internally pale hairy. Corolla intensely blue, 2.5~3.5 cm long, divided up to middle; lobes narrowly oblong, densely covered with pale hairs inside.

Distribution China(Xizang, Sichuan). Alt. 2700~4800 m.

Specimens examined CHINA: Sichuan: R. Soulie 2800(P); Batang, M. Soulie 9143 (P); Tongolo, J. Soulie 245(K, P), 2290(K, P), 2799(P); Tsekou, J. Soulie 1015(P); Near Tachienlu, 3000~4400 m, A. Pratt 572(BM, K); *ibid.*, R. Cunningham 364(E); Kangding, 3500 m, Kejian & Wenzie 804(PE); W Sichuan, Tongolo, R. Soulie 201(P).

7. *Cyananthus leiocalyx* (Franch.) Cowan, New Fl. Silva 10: 187. 1938.

Yunnan, China: Mt. Tsang chang, above Tali, 4000 m, 1884-08-04, M. Delavay 96 bis(lectotype(here designated)! P; isolectotype! K).

Perennial low ascending herbs; caudex woody. Stems 8~15 cm; shortly scaly at base; sparingly pilose. Leaves shortly petioled, winged; obovate, $0.6 \sim 1.0$ cm \times $0.4 \sim 0.6$ cm, attenuate at base, obtuse at apex, glaucous above, pubescent, covered with white adpressed hairs below; margin crenulate. Flowers peduncled, solitary, terminal; peduncle < 1.0 cm, glabrescent. Calyx cylindrical, 1.0 cm long, 0.7 cm broad; glabrous towards the apex, ciliate; blackish patch in the sinus; lobes divided to half, broadly triangular, obtuse at apex. Corolla purple, cylindrical, ca. 2.5 cm long, divided to the middle; lobes ovate-oblong, subacute at apex. Capsule conical, exceeding the calyx.

KEY TO THE SUBSPECIES

Calyx glaucous; leaves obovate-spathulate, glabrous above, moderately pubescent below subsp. *leiocalyx*
 Calyx glabrous, leaves elliptic lanceolate, pilose, shining on both sides subsp. *lucidus*

a. *Cyananthus leiocalyx* subsp. *leiocalyx* (Fig. 9)

Distribution India(Sikkim), China(Xizang, Yunnan). Alt. 3100~5000 m.

b. *Cyananthus leiocalyx* subsp. *lucidus* K. Shrestha, sub. sp. nov. (Fig. 10)

Xizang, China: Kam, between Dorchkhilin and the basin of Mekong river ($32^{\circ}15'N$, $96^{\circ}40'E$), 1900-09-06, V. Ladygin 530(holotype! LE; isotypes! LE).

Subspecies nostra a *C. leiocalyx* subsp. *leiocalyx* caulibus rigidis, foliis elliptico-lanceolatis utrinque sericeo-tomentosis differt.

A stout herb; caudex thick and woody. Stems many, reddish, puberulous, coarse, 10



Fig. 9 *Cyananthus leiocalyx* (Isolectotype, P)

Sherriff 9890 (BM).

Subsect. 2. **Perennes** Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 13. 1983, p. p.

Herbae perennes subprostratae. Calyx magnus glaber; corolla late cylindrica flava.

Herbs; flowers solitary; calyx glabrous, large, much changed in its texture in maturity; corolla yellow, broadly cylindrical.

Type: *Cyananthus flavus* C. Marq.

8. *Cyananthus macrocalyx* Franch. in J. Bot. (Paris) 1: 279. 1887; C. Marq. in Kew Bull. 1924: 251. 1924; Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 16. 1983; D. Y. Hong & L. M. Ma in Acta Phytotax. Sin. 29: 43. 1991—*C. neurocalyx* C. Y. Wu, Report on Studies of Trop. & Subtrop. Region of Yunnan 1: 86. 1965.

Yunnan, China: Mt. Konalapo, near Hokin, 1884-08-26, M. Delavay 96, fr. (lectotype (here designated)! P; isolectotypes! K, LE).

~ 15 cm high. Leaves shortly petioled, petiole winged; ciliate, elliptic-lanceolate, $0.7 \sim 1.3 \times 0.3 \sim 0.4$ cm, silvery, shining; moderately pubescent; margin entire. Flowers peduncled, peduncle $0.4 \sim 1.0$ cm long, glabrescent. Calyx $0.7 \sim 1.2 \times 0.5 \sim 0.8$ cm, nearly glabrous and coarse; divided to one third of its length; lobes triangular, acute at apex, densely hairy. Corolla light blue or lilac, > 3.0 cm long; lobed up to half, lobes ovate, acute at apex.

Distribution China (Xizang). Alt. 3500~5000 m.

Specimens examined CHINA: Xizang: SE Xizang, Kongbo, Mirala, Nyang chu, 3500 m, Ludlow, Sherriff and Taylor 6020 (BM, E, GH); ibid., 4600~5000 m, Ludlow, Sherriff and Taylor 6060 (BM, E); S Lhasa, 5000 m, Ludlow &

A perennial decumbent herb, rarely with woody caudex. Stems 7~20 cm; often covered with small scales at base; unbranched; minutely clothed with whitish coarse hairs. Leaves dense, petioles 0.2~0.3 cm long, winged and ciliate; ovate to spatulate, $0.6\sim1.0\times0.4\sim0.6$ cm, obtuse at base, moderately pilose above, minutely setose with whitish adpressed hairs below; margin entire, closely revolute. Flowers subsessile to moderately peduncled, solitary, terminal. Calyx tubular to cylindrical, 0.8~1.3 cm long; greenish, nearly glabrous, lobed to one third of its length. Corolla yellow, cylindrical, 2~2.5 cm long, divided up to the middle, densely hairy at throat; lobes oblong. Capsule conical, acute.



Fig. 10 *Cyananthus leiocalyx* subsp. *lucidus* (Holotype, LE)

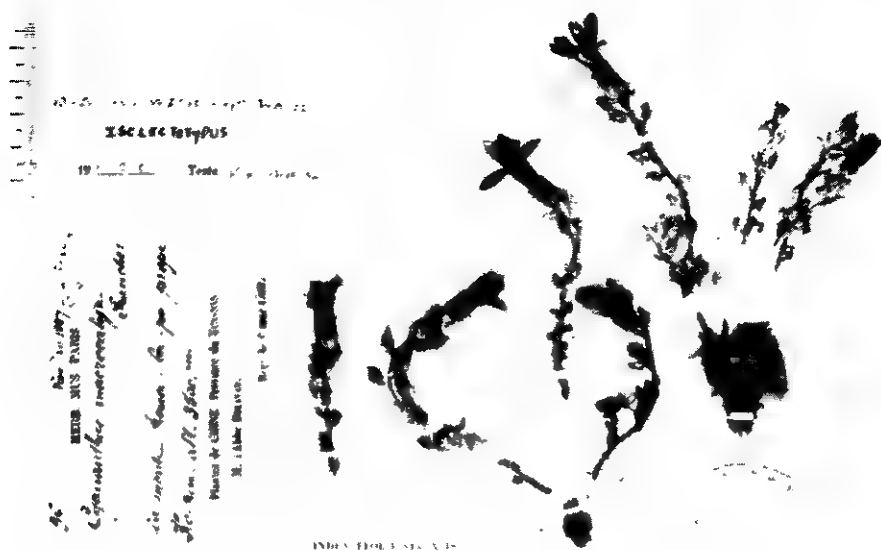
KEY TO THE SUBSPECIES

- Leaves ovate to suborbicular, entire; peduncle <0.5 cm long; calyx >1.1 cm long.....subsp. **macrocalyx**
 Leaves obovate-spatulate, crenulate; peduncle ca. 1.0 cm long; calyx <1.1 cm long
 subsp. **spathulifolius**

a. *Cyananthus macrocalyx* subsp. **macrocalyx** — *C. macrocalyx* var. *flavopureus* C. Marq. in Kew Bull. 1924: 252. 1924. (Fig. 11)

Distribution China (Xizang, Yunnan, Sichuan, Qinghai and Gansu). Alt. 2500~5000 m.

Specimens examined CHINA: Xizang: Sarong, Ka-gur-pu, 4300 m, G. Forrest 14514 (E, K); Sikang, Gerda, Tsa wa rung, 3500 m, C. W. Wang 65947 (GH), 3600 m, C. W. Wang 65530 (GH). Yunnan: Atuntze, 3700 m, C. W. Wang 68936 (GH), 69619 (GH); Atuntze, Bei ma shan, 4100 m, T. T. Yu 10752 (GH), 10812 (GH); Chien-chuan-Mekong divide, 4600 m, G. Forrest 23225 (K, US, W); Chio-kia Hsie n, H. T. Tsai 52039 (GH); Chungtien, Haba, 3600 m, T. T. Yu 13519 (GH); Dali ($25^{\circ}53'N$, $100^{\circ}01'$



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Fig. 11 *Cyananthus macrocalyx* Franch. (Isolectotype, LE)

E), 2900~3300 m, Bartholomew *et al*, 1984-07-18(US); Dokerla, 4500 m, H. Handel-Mazzetti 8138(W); Hee chan men, above Lankong, 3500 m, 1884-07-31, M. Delavay, s. n. (syntype! P; isosyntypes! K, LE, NY); Lichiang, 3400 m, C. Schneider 3171(GH, K); *ibid.*, 3700~4250 m, H. Handel-Mazzetti 3528(NY, W); Mekong-Salwin divide, 4280 m, H. Handel-Mazzetti 9776(K, W); Wei-si Hsien, 2500 m, C. W. Wang 67829(GH), 3600 m, C. W. Wang 68442(GH), 68448(GH), T. T. Yu 10639(GH); Yangtze hay, 3300 m, M. Delavay, 1887-07-18(P, US); E Yuragan, Mekong-Salween divide, 5000 m, J. Rock 23115(K, NY, US). Sichuan: Kangting(Tachienlu), 4200 m, H. Smith 11578(PE); Lieng ho kou, 4000 m, Wang & Wen 651(GH); Muli, 3400 m, J. Rock 17408(GH, US, W), 4300 m, J. Rock 18133(GH, K, P, US), 4750m, J. Rock 24523(GH, K, MO, NY, US); Muli, Kulu, T. T. Yu 14625(GH); Tachienlu, 3000~4400 m, A. Pratt 564(K); Xiang-chen, 4200 m, anonymous 3078(PE); Tah-liang-shan, 3700 m, T. T. Yu 4012(PE).

b. *Cyananthus macrocalyx* subsp. *spathulifolius*(Nannf.) K. Shrestha stat. et comb. nov. — *C. spathulifolius* Nannf. in *Acta Horti Gotoburg*, 5: 30. 1929. (Fig. 12)

Sichuan, China: 4000 m, in 1922, H. Smith 3042(holotype! E).

Distribution E Nepal, India(Assam), Sikkim, Bhutan, Myanmar, W China. 3000~5300 m.

Specimens examined NEPAL: E Nepal: Tamur Valley, Topke gola, 3500 m, J. Stainton 982(BM, GH); Tasagon(Topke goola), 4350 m, H. Ohashi *et al.* 772502(GH); Lumbasumba Himal, 5000 m, Beer, Lancaster & Morris 9444(BM); Inukhu khola, 4300 m, D. Mc Cosh 308 (BM, KATH.). SIKKIM: Doko la, D. Cummins s. n. (K); Yemuthang, 5100 m, R. Cooper 424(E). INDIA: Assam: Poshing la, 4000 m, F. K.

Ward 13959(BM). BHUTAN: Ura Wadongla, 4000 m, S. Bowes Lyon 15125(BM); Ridge of Tashigong, 3600 m, R. Cooper 4517(BM); Gafoola, Upper Pho chu, 4750 m, Ludlow, Sherriff & Hicks 16730(BM); Mela chola Valley, 4000m, Ludlow, Sherriff & Hicks 20439(BM); Meto lebo, 4600 m, B. Gould 1304(K). MYANMAR: W Central Myanmar: Int. Victoria, 3000 m, F. K. Ward 22832(BM). CHINA: Xizang: Phari, to Tsethanka, 5000 m, B. Gould 2387(K); Lhasa, Dungboo, s.n.(BM); Tsari, 4750 m, Ludlow & Sherriff 1947(BM); Tuna to Khambu, 5300m, B. Gould 2351(K); Kongbo, Budi Tsepola, 4100 m, Ludlow, Sherriff & Elliott 14420(BM); Putsang river Rong to Valley, 3300 m, K. Ward 10957(BM). Yunnan: Che-tse-lo, 4000 m, H. T. Tsai 58211(GH); Mekong-Yangtze divide, 27°05'N, 99°35'E, 4600 m, G. Forrest 25710(E). Sichuan: Muli, Mt. Mitzuga, 4750 m, J. Rock 23975(BM, GH, MO, NY); Mt. Konkaka, konkaling, 4000~5300 m, J. Rock 16881(E, GH, US, W). W China: 3300~4000 m, E Wilson 3982(BM, P).

9. *Cyananthus flavus* C.

Marq. in Kew Bull. 1924: 247. 1924; Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 21. 1983; D. Y. Hong & L. M. Ma in

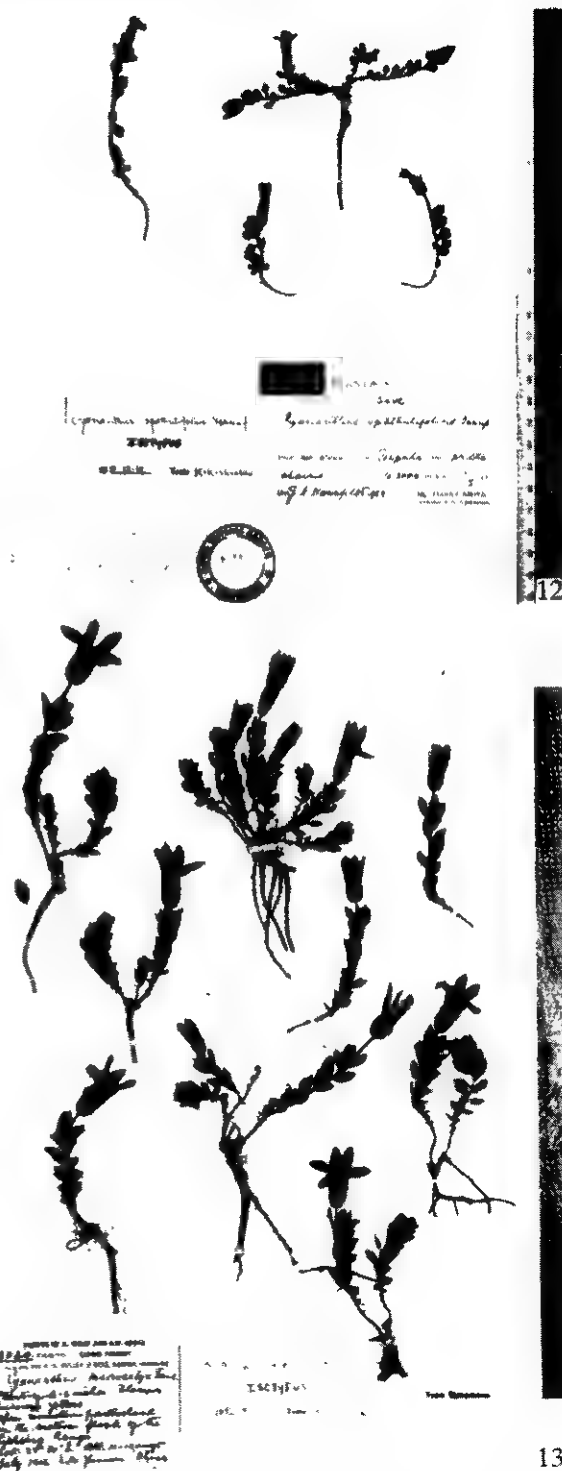


Fig. 12 *Cyananthus macrocalyx* subsp. *spathulifolius* (Isotype, E)

Fig. 13 *Cyananthus flavus* (Holotype, E)

Acta Phytotax. Sin. 29(1): 45. 1991.

Yunnan, China: Lichiang range, 3300~3600 m, G. Forrest 2530(holotype! K; isotypes! BM, E).

Perennial ascending herbs; caudex slender, rarely woody. Stems few, 7~12 cm, with scaly leaves rosulate, entire, submembranous at base; unbranched, glabrous to pilose. Leaves subsessile, elliptic-lanceolate, 1~1.6 cm × 0.5~0.7 cm, moderately to densely pilose, entire. Flowers solitary, terminal with peduncle 1.5~2.0 cm long, glabrous or moderately pilose. Calyx tubular, 1.0~1.3 cm long, glabrous; shortly lobed, lobes triangular, almost obtuse at apex, moderately whitish hispid inside the apex. Corolla pale yellow or white, broadly cylindrical, 2.0~2.5 cm long; lobed up to the middle, densely clothed with yellow hairs inside. Capsule subconical, long-exserted from calyx.

KEY TO THE SUBSPECIES

Stems glabrous; leaves subacute, moderately pubescent; corolla yellow subsp. **flavus**
 Stems pubescent; leaves acute, densely pubescent; corolla white subsp. **montanus**

a. *Cyananthus flavus* subsp. **flavus** (Fig. 13)

Distribution China(Yunnan). Alt. 3200~3600 m.

Specimens examined CHINA: Yunnan; Chungtien, C. Schneider 3870(GH, K, US); Mt. Gyina lo-ko, 4500 m, J. Rock 25014(BM, GH, K, NY, US); Lichiang, R. C. Ching, 20985(GH), 21291(GH), 30433(GH), H. Handel-Mazzetti 3758(W), G. Forrest 6102(BM, E, FI, K, W); *ibid.*, 4200 m, J. Rock 4747(US), 4000~4300 m, J. Rock 5825(NY), 3000~3300 m, J. Rock 6182(E, NY, P, US); *ibid.*, J. Rock 10442(E), C. Schneider 3644(GH), 3665(GH), 3870(GH, K); *ibid.*, 3200 m, T. T. Yu 15344(BM, E, GH, PE); *ibid.*, Mc Laren's native collectors 223 B(BM).

b. *Cyananthus flavus* subsp. **montanus**(C. Y. Wu)D. Y. Hong & L. M. Ma in Acta Phytotax. Sin. 29: 46. 1991. — *C. montanus* C. Y. Wu, Report on Studies of Trop. & Subtrop. Region of Yunnan 1: 89. 1965 — *C. mairei* (Le'vl.) Cowan, New Fl. Silva 10: 188. 1938. — *C. albiflorus* Chamb. in Notes Roy. Bot. Gard. Edinb. 35: 252. 1977, nom. nov. — *Wahlenbergia mairei* Le'vl. in Feddes Repert. 12: 285. 1913. (Fig. 14)

Yunnan, China: Tai-hai, 3200 m, 1912-07, E. Mairei, s. n. (holotype! E; isotype! E).

Perennial ascending herbs. Stems few, 10~17 cm, pilose. Leaves sessile, ovate-lanceolate to elliptic-lanceolate, 1.0~2.0 cm × 0.4~0.6 cm, acute at apex, moderately pilose, nearly entire. Flowers with peduncle 1.0~1.5 cm long, glabrous. Calyx tubular, 1.0~1.3 cm long, glabrous; shortly lobed, lobes triangular, acute at apex. Corolla white, broadly cylindrical, 2.0~3.0 cm long; deeply lobed. Capsule not seen.

Distribution China(Yunnan, Sichuan). Alt. 2700~3300 m.

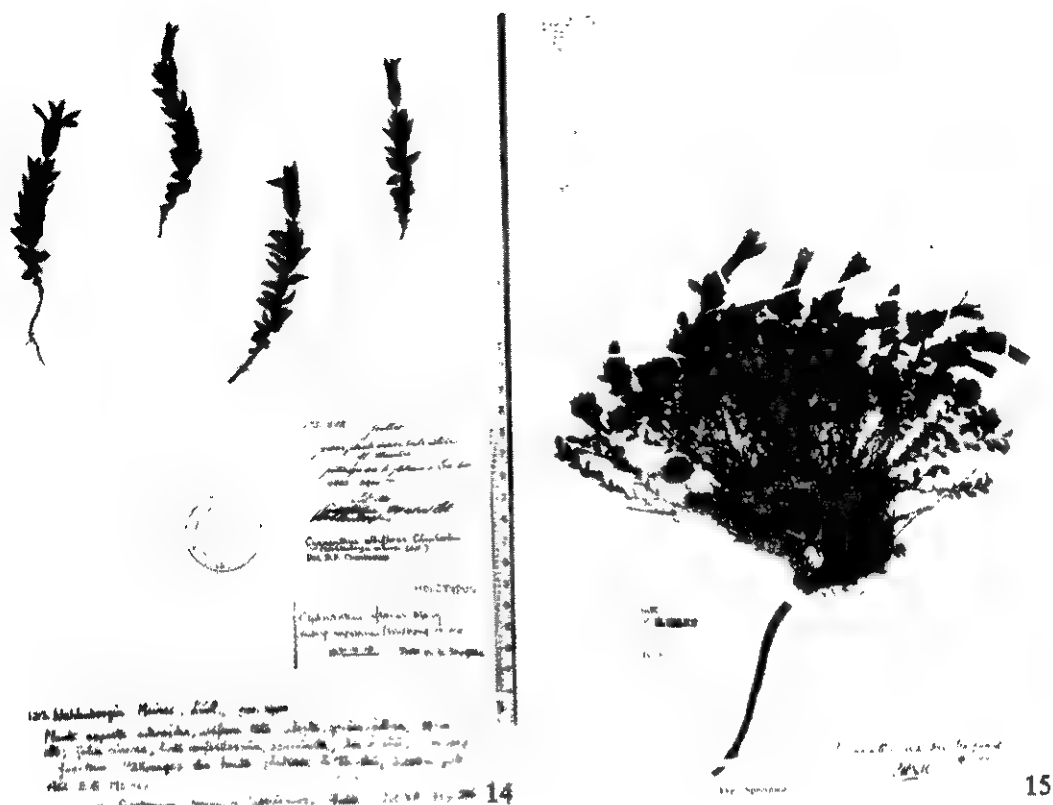


Fig. 14 *Cyananthus flavus* subsp. *montanus* (Holotype, E) Fig. 15 *Cyananthus wardii* (Holotype, K)

Specimens examined CHINA: W China: Mt. Lan-ngi-tsiu, 3200 m, E. Maire 656 (BM, E). Sichuan: Hsi-chang Hsien, T. T. Yu 1301 (GH).

Sect. 2. **Suffruticulosi** K. Shrestha, sect. nov.

Type: *C. sherriffii* Cowan.

Herbae suffruticuliformes perennes, caudice robusto foliis basalibus squamiformibus dense tecto. Calyx nigro- et brunneo-pilosus. Corolla sub- infundibuliformis. Planta montibus Tibet endemica.

Perennial, suffruticulose herbs; caudex well developed. Stems with several, dense scaly leaves at base. Flowers solitary; calyx with dark brown hairs; corolla nearly funnel-shaped, lobed to one third; capsule slightly exceeding calyx. Pollen (7)8(9)-colpate, large ($> 50 \mu\text{m}$), surface wavy, exine very thick with large lacuna. Seeds reticulate-striate, exotesta with thin epidermis and lamellated inner layer.

10. *Cyananthus wardii* C. Marq. in J. Linn. Soc. London (Bot.) 48: 196. 1929.

SE Xizang, China: Nambu la, 3400~3600 m, 1924-08-13, F. K. Ward 6082, p. p. (holotype! K). (Fig. 15)

Perennial suffruticulose ascending herbs; caudex thick, woody. Stems many, 14~18 cm, with sterile and fertile branches; sparsely pilose, with scaly leaves well developed, 1.0

$\sim 1.5 \times 0.3 \sim 0.4$ cm, moderately pubescent at base. Leaves subsessile, smaller below, larger upwards, oblanceolate, $0.7 \sim 1.1 \times 0.3 \sim 0.4$ cm, obtuse at apex, densely pilose with silky hairs on both sides, entire. Flowers shortly peduncled, solitary, terminal, peduncle 0.3 cm long, pubescent. Calyx broadly cylindrical, $0.9 \sim 1.2 \times 0.6 \sim 0.8$ cm, densely pilose, lobed up to half of its length, glabrous inside. Corolla blue, subtubular, $2.8 \sim 4.0$ cm long, lobed up to one third, lobes oblong, $0.9 \sim 1.3 \times 0.5$ cm, mucronate, white tomentose at throat. Stamens half as long as corolla tube. Style glabrous, slightly exceeding corolla tube. Capsule not seen.



Fig. 16 *Cyananthus sherriffii* Cowan (Holotype, BM)



Fig. 17 *Cyananthus microphyllus* (Holotype, K)

Distribution China (Xizang). Alt. 3600~5000 m.

Specimens examined CHINA: S Xizang: Bimbi la Tsari, 4600~5000 m, Ludlow & Sherriff 2557 (BM, E); Valley above Pemo, near Tongkyute Dzong, 3000 m, Ludlow, Sherriff & Elliott 12303 (BM); Lang la, 4300~4600 m, F. K. Ward 12003 (BM).

11. *Cyananthus sherriffii* Cowan, New Fl. Silva 10: 181. 1938; Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 12. 1983; D. Y. Hong & L. M. Ma in Acta Phyto-

tax. Sin. 29:48. 1991. (Fig. 16)

S Xizang, China: Gyandro, Chagul-charma, 4900 m, 1936-11-01, Ludlow and Sherriff 2819(holotype! BM).

Suffruticulose ascending robust herbs; root stock semi-woody. Stems numerous, 8~20 cm, minutely pubescent, with two types of branches: primary branches short, with dense leaves, pubescent; secondary branches thinner, much longer, sparingly pubescent. Leaves variable, subsessile, elliptic or ovate; $0.2\sim0.8\times0.1\sim0.3$ cm, obtuse at apex, glabrescent above, moderately pubescent below; margin sharply recurved, with long-ciliate hairs (1~2 mm). Flowers shortly peduncled, peduncle $0.2\sim0.6$ cm long, moderately pubescent. Calyx cylindrical, $0.8\sim1.3\times0.6\sim0.8$ cm, densely clothed with black and brown hairs; lobed to one third, lobes $0.4\sim0.5$ cm long, ovate-triangular, acute at apex. Corolla pale blue, subinfundibular, $2.0\sim4.0$ cm long; lobed to one third, long-hairy at throat; lobes $1.0\sim1.3\times0.4\sim0.6$ cm, oblong, rounded at apex and spreading. Stamens half as long as corolla tube, anthers very small, filaments pubescent; stigma 5-fid. Capsule conical, $1.1\sim1.4$ cm long, slightly exerting the calyx.

Distribution China(Xizang). Alt. 3400~5300 m.

Specimens examined CHINA: Xizang: Bimbi la, Tsari, 4500 m, Ludlow, Sherriff & Taylor 2786(BM); Tsari, $28^{\circ}45'N$, $93^{\circ}28'E$, 4500 m, Ludlow, Sherriff & Taylor 6336 (BM, GH); ibid., 4300~5000 m, F. K. Ward 12320(BM); ibid., anonymous 12320 (MO); Mago, 3600~4000 m, F. K. Ward 12392(BM); Kongbo, Lang la, 4150 m, Ludlow, Sherriff & Elliott 13329(BM); Kongbo, Molo, Lilung chu, 3450 m, Ludlow, Sherriff & Taylor 6545(BM, E); Trakan la, char cun, 4600~5300 m, Ludlow & Sherriff 1989(BM); Kashongha chagul cum, 4800 m, Ludlow & Sherriff 2390(BM); Le la chagul charma, 5000 m, Ludlow & Sherriff 2458(BM); Pa la Valley, Kyingdong, 4150 m, Ludlow & Sherriff 2684(BM).

Sect. 3. **Cyananthus**—*Cyananthus* A. Platylobi Franch. in J. Bot. (Paris) 1: 258. 1887, stat. indefinit. — *Cyananthus* sect. *Platylobi* (Franch.) C. Marq. in Kew Bull. 1924: 242. 1924.

Perennial weak herbs, usually with distinct caudex. Flowers short- or long-peduncled, solitary, terminal, showy. Calyx black hirsute, not changed in fruiting. Corolla funnel-shaped, with distinct tube, short-cleft, lobes broader than long, petals predominantly blue, hairy or glabrous at throat. Capsule as long as persistent calyx. Pollen(6)7 or 8(9)-colpate, oblate-spheroid, exine smooth; spinules conical, distinct; perforations small and sparse. Seeds large, narrowly elliptic; black to dark brown, sculpture reticulate-striate, nearly without constrictions and pores in exotesta.

Distribution India(Punjab to Assam), Nepal, Bhutan, Myanmar, China(SE Xizang, Yunnan).

12. **Cyananthus microphyllus** Edgew. in Trans. Linn. Soc. (London) 20: 82. 1846;

C. Marq. in Kew Bull. 6: 253. 1924; Hara, Enum. Fl. Pl. Nepal 3: 147. 1982; Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 12. 1983; D. Y. Hong & L. M. Ma in Acta Phytotax. Sin. 29: 48. 1991. — *Cyananthus linifolius* Wall. ex Hook. f. et Thomson in J. Linn. Soc. London (Bot.) 2: 20. 1858, nom. confus. (p. p.); Wall., Catal. 130, N 3722. 1831, nom. nud.; C. B. Clarke in Hook. f., Fl. Brit. Ind. 3: 20. 1881; Franch. in J. Bot. (Paris) 1: 260. 1887. — *Cyananthus nepalensis* Kitam. in Acta Phytotax. Geobot. (Kyoto) 15: 109. 1954.

W Himalaya: Above Mana, in 1844, M. Edgeworth 456 (holotype! K).

A prostrate perennial herb, with a woody caudex. Stems 10~30 cm, numerous, filiform, reddish, minutely pubescent. Leaves subsessile, oblong or lanceolate, 0.3~0.8×0.1~0.3 cm, slightly acute at apex, glabrous above, adpressed-pubescent beneath. Flowers subsessile to long-peduncled, solitary and terminal, moderately pubescent. Calyx tubular-cylindrical, 0.8~1.1×0.4~0.6 cm, pilose with black dense hirsute hairs; lobed to one third, lobes 0.2~0.4 cm long, oblong. Corolla blue, tubular, 1.7~2.7 cm long; lobed to one third or more, lobes 0.6~1.0×0.3~0.5 cm spreading, densely hairy at throat. Stamens filiform, anthers cordate-ovate; stigma 5-partite or subcapitate (clavate). Capsule 1.0~1.2 cm long, equaling the calyx.

KEY TO THE SUBSPECIES

- Leaves small, not membranous; Peduncle short, <1.0 cm long; calyx blackish, densely hirsute subsp. **microphyllus**
 Leaves larger, membranous; peduncle up to 2.0 cm long; calyx greyish, sparsely hairy subsp. **williamsonii**

a. **C. microphyllus** subsp. **microphyllus** (Fig. 17)

Distribution India (Punjab, Kumaon-Garhwal), Nepal, China (Xizang). Alt. 3300~5300 m.

Specimens examined INDIA: NW India: Kumaon, Ralum, 4000 m, Strachey & Winterbottom 2 (K, LE); Kumaon, Parbhu, Jori Valley, J. Duthie 24623 (LE); Garhwal, Mana to Sarsutti, 3300~4300 m, Schlagintweit, s.n. (GH); Garhwal, Badri Nath, 3250 m, F. Billet & J. Leonard 6647 (K). NEPAL: W Nepal: Jumla, 3450 m, O. Polunin, W. Sykes & L. Williams 391 (BM); Jumla, Danfay lekh, 3200 m, K. Shrestha & N. Manandhar 65 (KATH); Rara, 4000 m, Itoh & Rajbhandari (KATH); Dolpa, Phoksund, 4000 m, K. Rajbhandari & K. Malla 6884 (KATH); Tukucha, Kali gandaki, 4000 m, J. Stainton, W. Sykes & L. Williams 7731 (BM); Mukti Nath, 4150 m, D. Lowndes 1315 (BM), J. Stainton, W. Sykes & L. Williams 2037 (BM). Central Nepal: Below Ganesh Himal, Khorlak, 5300 m, L. Dhwoj 28 (BM); Charikot, Kalingchowk, 3600 m, M. Banerji 1400 (GH); Kalingchowk, 3600 m, Banerjee, K. Shrestha & Upadhyaya 2726 (KATH); ibid., 4000 m, S. Malla & S. Rajbhandari 405 (KATH); Kalingchok, Rukthang, 3300~3650 m, H. Kanai, K. Shrestha & S. Adhikari 674648 (KATH). E Nepal:

Khumbu, Kunde, 4300 m, A. Schilling 941(K); Khumbu, Pheriche, 4600 m, A. Horsfall 5(BM); Solukhumbu, Pike, 3500~4000 m, H. Ohba *et al.* 8581389(BM, E); E of Chalike Pahar, 4750 m, J. Stainton, W. Sykes & L. Williams 3701(BM, W).

b. *Cyananthus microphyllus* subsp. *williamsonii* K. Shrestha, subsp. nov. (Fig. 18)

Subspecies nostra a *C. microphylo* subsp. *microphylo* floribus longe pedunculatis, foliis membranaceis late ovatis necnon calyce pilis brevibus griseo-nigris sparse oblecto differt.

Perennial decumbent herbs, up to 30 cm high. Stems many, slender, with minute scaly leaves at base; glabrous, glabrescent at apex. Leaves sessile, 0.6~1.0 × 0.2~0.4 cm, ovate-cordate to ovate-lanceolate, membranous, obtuse at apex, nearly glabrous on both side, minutely serrate, revolute at margin. Flowers solitary, terminal, distinctly peduncled; peduncle slender, 0.4~2.0 cm long, sparsely hairy with short black hairs. Calyx cylindrical, 0.7~1.0 cm long, shortly lobed, lobes triangular, acute at apex; greenish-black, smooth with sparse, short, rigid, black hairs, densely clothed inside. Corolla long, funnel-shaped to broadly tubular, 2.0~3.0 cm long, lobed to one third to nearly half; lobes broader at middle, mucronate at apex; violet-blue, densely hairy at throat. Stamens 5, anthers ovate-cordate, imperfectly connate, equal in height with calyx. Style long; stigma deeply 5-parted. Capsule slightly longer than calyx, calyx not changed in maturity.

W Nepal: Phoksunde Tal, 5000 m, 1952-09-21, O. Polunin, W. Sykes & L. Williams 3537(holotype! BM; isotype! P).

Distribution W Central Nepal. Alt. 4150~5000 m.

Specimens examined NEPAL: Khangsar, 5000 m, D. Lowndes 1236 (BM, E); Salze khola, near Bimtakothi, 4150 m, D. Lowndes 1493(BM); Tegar(N Mustang), 5000 m, O. Polunin, W. Sykes & L. Williams 2225(E); Mustang, Marche 4200 m, K.

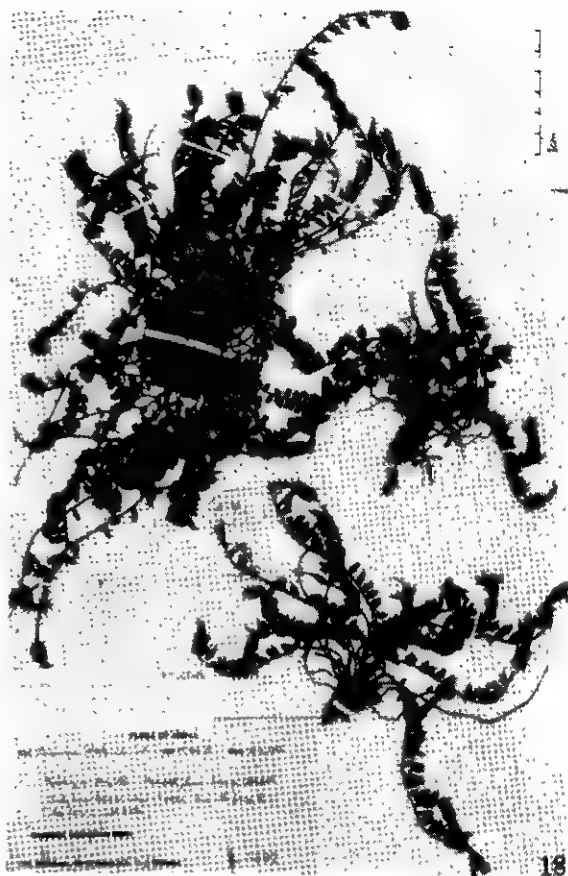


Fig. 18 *Cyananthus microphyllus* subsp. *williamsonii* (Holotype, BM)

Shrestha & M. Bista 2479(KATH).

13. *Cyananthus integer* Wall. ex Benth. in Royle, Ill. Bot. Himal.: tab. 69. 1835; idem, l. c. 309. 1836; Wall. Catal. 40, N 1472. 1829, nom. nud.; C. B. Clarke, in Hook. f., Fl. Brit. Ind. 3: 434. 1881; Franch. J. Bot. (Paris) 1: 259. 1887; C. Marq. in Kew Bull. 1924: 252. 1924; D. Y. Hong & L. M. Ma in Acta Phytotax. Sin. 29: 46. 1991. — *Cyananthus barbata* Edgew. in Trans. Linn. Soc. Bot. (London) 20: 82. 1846. (Fig. 19)

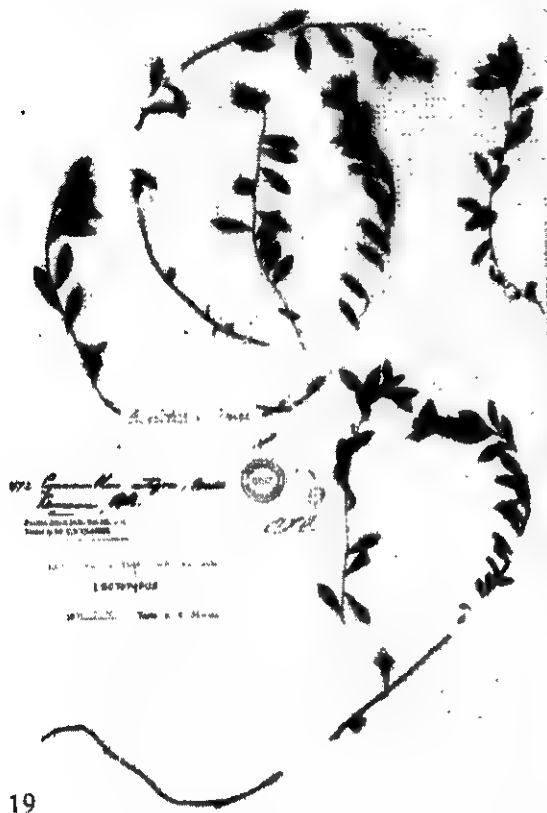


Fig. 19 *Cyananthus integer* (Lectotype, K)

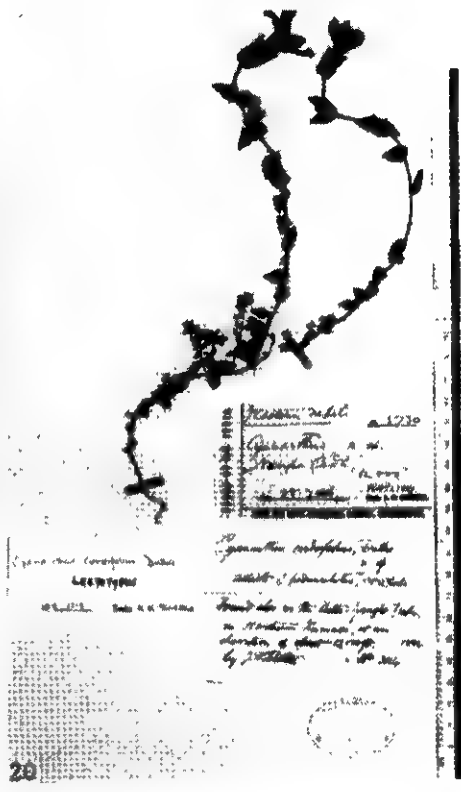


Fig. 20 *Cyananthus cordifolius* (Lectotype, K)

India: Kumaon, N. Wallich, Catal. 1472 (lectotype (here designated)! K; isoelectotypes! BM, E, LE, NY, P, W).

Perennial prostrate herbs. Stems 15~30 cm, unbranched, glabrous and shining below, ascending and minutely pubescent above. Leaves subsessile, elliptic or obovate-lanceolate, 1.0~2.0×0.4~0.7 cm, acute at apex, serrate up to the middle, minutely pubescent. Flowers shortly peduncled, peduncle 0.2~0.5 cm long, pilose. Calyx cylindrical, 1.2~1.5×0.7~0.9 cm, black villous; lobed to one third or more, lobes ovate-lanceolate, acute at apex. Corolla pale blue, narrowly campanulate, 2.5~3.5 cm long; lobes short, 0.6~1.1×0.4~0.8 cm, widely ovate. Stamens as long as corolla tube, filaments slender, anthers oblong. Stigma capitate or 5-lobed.

Distribution NW India(Kumaon, Garhwal). Alt. 3200~3600 m.

Specimens examined INDIA: NW India: Kedarkanta, Royle (syntype, LIV ?; isosyntype! LE); Garhwal, Falconer 614(LE), 617(GH, K, P); Tihri-Garhwal, Hill above Suki in Ganges Valley, J. Duthie 607(BM, CAL, LE); Tehri-Garhwal, Haridwar, N. Sahni 21928(GH); Tehri, above Luni, W. Koelz 21937(NY); Garhwal, Tungnath, R. Strachey & J. Winterbottom 3(P), K. Ram 8983(E); Kedarkanta, J. Duthie, 1194(FI, K, LE); Kumaon, Rur Pass, 3600 m, R. Strachey & J. Winterbottom 3(BM, GH, K); ibid., Ledebour, s. n. (LE). W HIMALAYA: M. Edgeworth 455(K).

14. *Cyananthus cordifolius* Duthie in Kew Bull. 1:37. 1912; C. Marq. in Kew Bull. 1924: 251. 1924; Hara, Enum. Fl. Pl. Nepal 3:51. 1982; Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 13. 1983; D. Y. Hong & L. M. Ma in Acta Phytotax. Sin. 29: 48. 1991. (Fig. 20)

W Nepal: Nampa gadh, 3350 m, 1886-07-28, J. F. Duthie 5730(lectotype(here designated)! K).

A prostrate perennial herb. Stems 12~25 cm, sometimes with small sterile branchlets diverged from lower axils. Leaves variable, sessile, 0.6~1.6×0.4~0.8 cm, triangular-ovate, cordate at base, subacute at apex; glabrous above, sparsely pubescent beneath; margin crenate and revolute; leaves much smaller on sterile branchlets, ovate, rotundate at base, entire. Flowers peduncled, peduncle 0.7~2.0 cm long, densely hirsute. Calyx 1.4~1.7×0.6~0.8 cm, densely black-hirsute; almost divided up to the middle, lobes lanceolate, 1.0~1.5×0.5~0.6 cm, acute at apex. Corolla blue, 2.5~3.4 cm long, lobed to more than one third of its length, rounded at apex. Capsule not seen.

Distribution NW India(Kumaon), Nepal, China(Xizang). Alt. 3900~5000 m.

Specimens examined INDIA: NW India: Kumaon (Kutti Yangti Valley, Byans), 3900~4300 m, 1886-07-26, J. F. Duthie 3114(syntype! BM; isosyntype! LE). NEPAL: Khangsar, 5000 m, D. G. Lowndes 1236(E); Marsyangdi Valley, Tilicho lake, 4600 m, R. J. D. Mc Beath 1461(E). CHINA: Xizang: Gyirong, 4400 m, Qinghai-Xizang Exped. 75-7185(KUN, PE).

15. *Cyananthus lobatus* Wall. ex Benth. in Royle, Ill. Bot. Himal.: tab. 69. 1835; idem, l. c. 309. 1836; Wall. Catal. 40, N 1473. 1829, nom. nud.; C. B. Clarke in Hook. f., Fl. Brit. Ind. 3: 433. 1881; Franch. in J. Bot. (Paris) 1: 259. 1887; C. Marq. in Kew Bull. 1924: 246. 1924; Hara, Enum. Fl. Nepal 3: 52. 1982; Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 8. 1983; D. Y. Hong & L. M. Ma in Acta Phytotax. Sin. 29: 47. 1991. — *Cyananthus insignis* Grahame, Gard. Chron. Ser. 3, 107: 10. 1940. (Fig. 21)

Nepal: Gosainkunda, N. Wallich's collector in 1821, Catal. 1473(lectotype(here designated)! K; isolectotypes! LE, MO, NY, P, W).

A densely tufted decumbent perennial herb, caudex large, thick and woody. Stems 20



SENT BY HIS MAJESTY THE KING

ROYAL HERBARIUM

General Name: *Cyananthus lobatus* (Lectotype)

Former Name:

Author: Walp.

Number: 1842

Date: 1842

Locality: India

Collector: R. H. B. & J. H. B.

Number: 1842

Date: 1842

Locality: India

Collector: R. H. B. & J. H. B.

Number: 1842

Date: 1842

Locality: India

Collector: R. H. B. & J. H. B.

Number: 1842

Date: 1842

Locality: India

Collector: R. H. B. & J. H. B.

Number: 1842

Date: 1842

Locality: India

Collector: R. H. B. & J. H. B.

Number: 1842

Date: 1842

Locality: India

Collector: R. H. B. & J. H. B.

Number: 1842

Date: 1842

Locality: India

Collector: R. H. B. & J. H. B.

Number: 1842

Date: 1842

Locality: India

Collector: R. H. B. & J. H. B.

Number: 1842

Date: 1842

~ 45 cm, ascending, unbranched, glabrescent. Leaves 2.0 ~ 4.0 (incl. petiole) \times 0.8 ~ 1.5 cm, narrowly cuneate or cuneate-obovate, 3 ~ 5 lobed, lobes entire or crenately cut, narrowed into a broad petiole, glabrous or sparingly hairy. Flowers peduncled, peduncle 0.4 ~ 1.7 cm long, pilose. Calyx broadly tubular, 1.2 ~ 1.5 \times 0.5 ~ 0.8 cm; densely clothed with dark-brown soft hairs; lobed to one third, lobes 0.3 ~ 0.6 cm long, triangular, acute at apex. Corolla deep violet-blue, paler towards the throat; 2.5 ~ 3.5 cm long, lobed to one third of its length, tube broad, lobes 1.3 ~ 1.7 \times 0.9 ~ 1.1 cm, obovate, spreading, recurved with a minute bearded point. Stamens slender; stigma with five short spreading teeth. Capsule nearly included in the calyx.

21

Distribution India (Punjab to Sikkim and Assam), Nepal, Bhutan, NE Myanmar, China (Xizang, Yunnan). Alt. 2800 ~ 4800 m.

Specimens examined INDIA:

NW India: Punjab, Kunawar, J. Drummond 22199 (P); Kulu, W. Koelz 1357 (NY); Lahul, R. Stewart 393 (GH, NY); Kashmir, Chilas, B. Wadhwa & J. Uohra 604 (CAL); Garhwal, Nila Valley, J. Duthie 608 (LE); Kedarkanta, J. Duthie 1193 (K, LE), J. Royle, s. n. (syntype, LIV ?; isosyntype! LE); Kumaon, in 1827, N. Wallich, Catal. 1473 (syntype! K; isosyntypes! BM, LE, P); ibid., Ralum, Strachey & Winterbot-

22

Fig. 21 *Cyananthus lobatus* (Lectotype, K)

Fig. 22 *Cyananthus hayanus* (Holotype, BM)

tom 1(LE). NEPAL: W Nepal: Doti, 4000 m, Itoh & Rajbhandari 1274(KATH); Bajhang, 4150 m, Bista & Joshi 626(KATH); Darchula, 3400 m, Shakya, Adhikary & Subedi 8015(KATH); Jumla, 3600 m, S. Malla 14002(KATH); Mugu, 3400 m, P. Shakya, M. Subedi & B. Uprety 8622(KATH); Kalikot, 3250 m, P. Shakya *et al.* 8452(KATH); Dolpo, C. Grey-Wilson & Philips 767(BM); Tukucha, Kali gandaki, J. Stainton, W. Sykes & L. Williams 7398(GH); Muktinath, J. Stainton, W. Sykes & L. Williams 2043(BM). Central Nepal: Baglung, 3400 m, D. Joshi *et al.* 206/85(KATH); Marsyangdi Valley, D. Lowndes 1389(BM); Langtang, D. Nicolson 2561(US); Chandanbari, 3500 m, K. Shrestha 124(KATH, LE); Langsisa kharka, 5100 m, O. Polunin 1902(E, P); Annapurna Himal, Seti khola, J. Stainton, W. Sykes & L. Williams 6585(GH, P). E Nepal: Kalingchowk, M. Banerjee 1233(GH); Barahpokhari, D. Lowndes 1524(E); Helambu, 4250 m, RLFA H13(KATH); Sankhuwasava, 4100 m, K. Shrestha & P. Shakya 9158(KATH); Topke gola, H. Ohba 772574(GH); Solokhumbu, Benikharka, H. Ohba *et al.* 8531207(E). SIKKIM: J. Hooker, s.n.(BM, GH, P, W); Jongri, C. B. Clarke 25766(K, LE); Bijan, G. King's collector, s.n.(CAL). BHUTAN: Thimpu, Bigger 2971(E); Pumthang, R. Cooper 2132(E); Upper Mo chu, Pari la, Sinclair & Long 5067(E). ASSAM: NW Assam: Se la, Rankin & Pretzlik 154(BM); Orka la, F. K. Ward 14311(BM); R. Rao 1625(CAL). MYANMAR: W flank of N Maikha-Salwin divide, G. Forrest 27443(BM, E, K, NY, P, US, W). CHINA: Xizang: Tsarung, J. Rock 22265(BM, GH, K, NY, US); Tsari, Ludlow & Sherriff 2799(BM); Kongbo, Mirala, Ludlow, Sherriff & Taylor 6127(E); Yatung, H. Hobson s.n.(K); Sikang, Tsawarung, H. T. Tsai 65613(GH); Yunnan: Che-tse-lo, H. T. Tsai 58247(GH, PE); Lichiang, H. McLarn's collectors 123(BM); Mekong-Salwin divide, G. Forrest 20410(US, W).

16. *Cyananthus hayanus* C. Marq., New Fl. Silva 8:207. 1936, 'hayana'; Hay in J. Roy. Hort. Soc. 59, 6: 461. 1934, nom. nud.; Hara, Enum. Fl. Pl. Nepal 3: 51. 1982. (Fig. 22)

Nepal: Panjen, 4500 m, 1932-08-18, K. Sharma E 427(holotype! BM; isotype! E).

A dwarf perennial herb; Caudex slender, apparently stoloniferous. Stems 8~10 cm, ascending, sparsely pilose; basal scaly leaves minute, ovate, acute. Leaves petioled, petiole 2.0~2.5 cm long, blades 5-fid, triangular at base, 0.7~0.9×0.5~0.7 cm; glabrescent above, tomentose beneath. Peduncle 1.5~3 cm long, hirsute. Calyx campanulate, 0.6~0.9 cm long; lobed to half of its length, spreading, clothed with ascending blackish hairs. Corolla blue, infundibular, 2.0~2.5 cm long; hairy at throat, lobed to one third, lobes obovate, 0.5×0.7 cm, mucronate at apex. Stamens slender, 0.8~0.9 cm long, anthers ovate, 0.25 cm long; stigma subcapitate, very shortly 5-fid. Capsule not seen.

Distribution C Nepal. Alt. 3500~4800 m.

Specimens examined NEPAL: Dolpo?, Danga Zong, 4200 m, Grey-Wilson & Philips

767(BM); Tukucha(Kali gandaki), 3500 m, J. Stainton, W. Sykes & L. Williams 7453 (E); Samargaon(N Tukucha), 5000 m, J. Stainton, W. Sykes & L. Williams 7259(E); Marsyangdi Valley, 3100 m, D. G. Lowndes 1484(BM).

17. *Cyananthus pedunculatus* C. B. Clarke in Hook. f., Fl. Brit. Ind. 3: 434. 1881; Franch. in J. Bot. (Paris) 1: 260. 1887; C. Marq. in Kew Bull. 6: 251. 1924; Hara, Enum. Fl. Pl. Nepal 3: 147. 1982; Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73 (2): 10. 1983; D. Y. Hong & L. M. Ma Acta Phytotax. Sin. 29: 47. 1991. — *Cyananthus linifolius* Wall. (Catal. 130, N 3722. 1831, nom. nud.) ex Hook. f. et Thomson in J. Linn. Soc. (Bot.) 2: 20. 1858, nom. confus. p. p. — *Cyananthus sericeus* Y. S. Lian in Acta Phytotax. Sin. 29: 47. 1979, syn. nov. (Fig. 23)

Sikkim: Lachong, 3900 m, 1849-09-05, J. Hooker, s. n. (lectotype (here designated)! K; isolectotype! P).

Perennial decumbent herbs. Stems 8.0~20 cm, simple or with weak barren branches at base, glabrescent below, hairy upwards. Leaves sessile, oblong, 1.3~2.0 × 0.3~0.6 cm, entire, moderately pilose. Flowers long-peduncled, peduncle 1.3~3.5 cm long, black hirsute. Calyx cylindrical, 1.0~1.3 cm long, densely clothed with black brown soft hairs. Corolla blue, funnel-shaped, ca. 2.5 cm long; lobed to one third or less, lobes obovate, glabrous at throat. Capsule conic, 1.0~1.3 cm long, equalling calyx.

Distribution E Nepal, E India(Sikkim), Bhutan, and China(Xizang). Alt. 3700~4800 m.

Specimens examined NEPAL: E Nepal: Tamur Valley, Ghunsa, E of Wolangchung gola, 5250 m, J. Stainton 1126(BM); Khumbu, Kunde, A. Schilling 944(K); Jaljale Himal, Beer, Lancaster & Morris 10188(BM); Upper west Ombula tha Valley, G. Smith 160(BM). Central Nepal: Purugang, F. Bailey, s. n. (BM); Pongsing, L. Dhwoj 139 (BM, E); Serkathan, K. Sharma E 426(BM, E); Yalung, Binns, Mason & Wright 140 (E). SIKKIM: Dzongri, Starling *et al.* 428(K), T. Anderson 758(CAL); Samdong, 4600~5250 m, 1849-09-24, J. Hooker s. n. (syntype! K; isosyntypes! LE, NY, W); *ibid.*, 5500 m, G. Gammie 864(CAL); Elwes. s. n. (syntype! K; isosyntypes! LE, W); Yakla, 4500~5200 m, C. B. Clarke, s. n. (syntype, K ?); *ibid.*, R. Cooper 590(E); Sangla, Ribu & Rohmoo 5342(E, K); Ghora la, Ribu & Rohmoo 5639(K); Langnak la to Thanga, G. Cave 64(K); Tanga, Smith & Cave 2533(P). BHUTAN: Ghira, B. Gould 1312(K). CHINA: Xizang: Yatung, H. Hobson, s. n. (K), Qinghai-Tibet Exped. 74~2369(PE); Chumbi, G. King 35(K), 136(LE); Near Kampu, Cutting & Vernay 106 (K); Tung-ka-la, N Ze-lep-la, Dungboo, s. n. (K).

18. *Cyananthus himalaicus* K. Shrestha in Brittonia 44: 253. 1992. (Fig. 24)

Nepal: South of Gurjakhani, 28°36'N, 83°13'E, 3450 m, 1954-07-18, J. Stainton, W. Sykes & L. Williams 3918(holotype! BM; isotypes! E, GH).

Perennial decumbent herbs. Stems 20~30 cm, with a few minute scales at base; un-

branched, ascending, glabrescent to minutely pubescent. Leaves shortly petiolate, petiole 0.5~2 mm long; blade broadly ovate, 1.0~2.0 × 0.5~1.1 cm, subcordate at base, subacute at apex, undulate, crenate, the margins plane, softly silky tomentose on both surfaces. Flowers solitary and terminal; peduncle, 2.5~8.5 cm long, glabrescent, minutely pubescent at the apex. Calyx cylindrical, ca. 1.0 × 0.6 cm, shortly 5-dentate, lobes 3 mm long, 3 mm broad at base, triangular; acute at apex, with short, straight, rigid black hairs. Corolla purple, broadly funnel-shaped, 2.5~3.0 cm long, 2 cm broad at apex, abruptly narrowed to throat, throat glabrous, 7 mm broad, lobes 0.4 × 0.8 cm, erect, obovate, mucronate at apex. Stamens 1~1.5 cm long, anthers cordate-ovate; pistil 1.5~2 cm long, stigma capitate. Capsule not seen.

Distribution Central Nepal. Alt. 3400~3600 m.

Specimen examined NEPAL: Central Nepal: SW Gurjakhani, 3450 m, 1954-10-20, J. Stainton, W. Sykes & L. Williams 9103(BM).

Sect. 4. *Annui* (Y. S. Lian) K. Shrestha, stat. nov.; D. Y. Hong & L. M. Ma in Acta Phytotax. Sin. 29: 48. 1991, comb. invalid. (typus error. indicat.)—Sect. *Stenolobi* subsect. *Annui* Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 183. 1983.—*Cyananthus* B. *Stenolobi* Franch. in J. Bot. (Paris) 1:258. 1887, p.p., excl. typo.

Type: *Cyananthus inflatus* Hook. f. & Thomson

Annual slender herbs. Flowers solitary, terminal. Calyx with brown hairs. Corolla tubular, lobed to one third to half; capsule longer than calyx, very much changed in texture during maturity. Pollen small, 7 or 8-colpate, more or less spheroid, polar cap poorly developed or absent; spinules small, perforations comparatively large. Seeds small (<1.0 mm

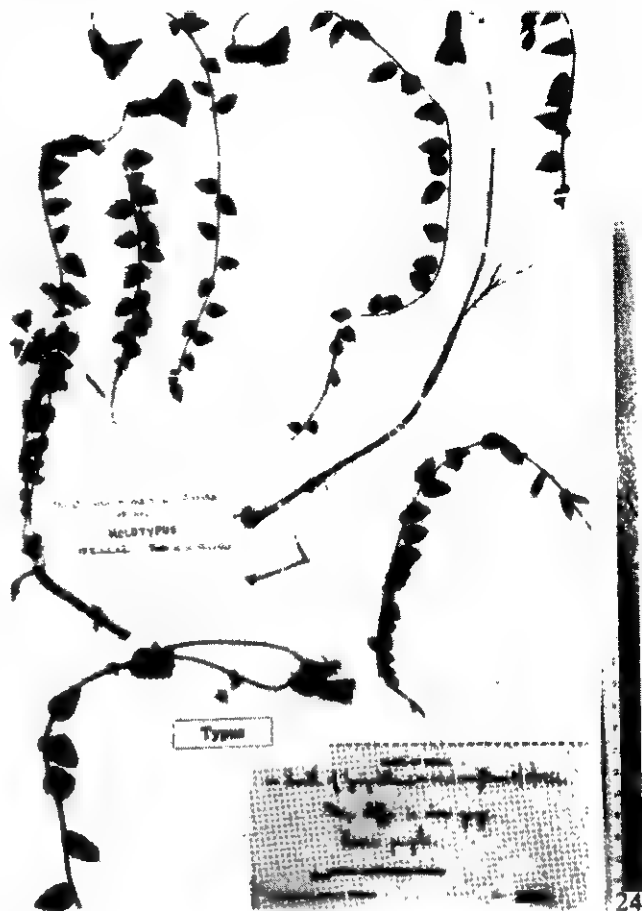


Fig. 24 *Cyananthus himalaicus* (Holotype, BM)

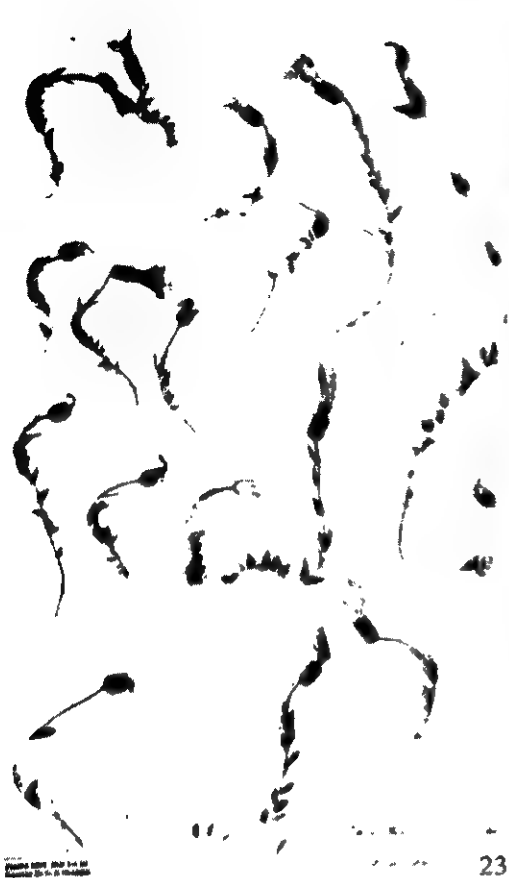


Fig. 23 *Cyananthus pedunculatus* (Lectotype, K)



Fig. 25 *Cyananthus lichiangensis* (Holotype, E)

long), surface very variable (reticulate to striate), ribs spirally arranged and comparatively narrow.

Subsect. 1. **Lichiangenses** K. Shrestha, subsect. nov. — Sect. *Stenolobi* subsect. *Annui* Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 183. 1983, p.p., excl. typo.

Type: *Cyananthus lichiangensis* W.W. Smith

Herbae annuae. Flores pentameri. Calyx late cylindricus, in lobos apice obtusos profunde incisus, basi glanduloso-pilosus. Corollae limbus vix late lobatus, flava.

Flowers perfectly pentamerous; calyx broad, cylindrical, deeply lobed, stiff-hairy, with glands at base; lobes obtuse at apex; corolla broad, yellow.

19. *Cyananthus lichiangensis* W. W. Smith in Notes Roy. Bot. Gard. Edinb. 8: 109. 1913; C. Marq. in Kew Bull. 1924: 247. 1924; Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 24. 1983; D. Y. Hong & L. M. Ma in Acta Phytotax. Sin. 29: 48. 1991. (Fig. 25)

Yunnan, China: W flank of Lichiang range, 3900 m, 1910-08, G. forrest 6369 (holo-

type! E; isotype! K).

Annual stout decumbent herbs. Stems many, 10 ~ 30 cm, above rarely branched, glabrous. Leaves petiolate, petiole 0.2 ~ 0.6 cm long; leaf blades 0.8 ~ 1.2 × 0.5 ~ 1.0 cm, obovate-spathulate, cuneate at base, rounded at apex, moderately pubescent, undulate, crenate. Flowers terminal; peduncle 0.1 ~ 0.4 cm long, glabrous. Calyx broadly cylindrical, 0.8 ~ 1.7 × 0.5 ~ 1.0 cm; deeply lobed, lobes 0.3 ~ 0.6 cm long, obtuse at apex; yellow puberulous, with dense dark tubercles at base. Corolla light yellow, broadly tubular, 1.4 ~ 2.6 cm long, 0.7 ~ 0.8 cm broad; lobes 0.3 ~ 0.8 × 0.2 ~ 0.35 cm, ovate, obtuse at apex. Stamens 0.5 cm long. Capsule 1.0 ~ 1.5 cm long, not inflated.

Distribution China(Xizang, Yunnan, Sichuan). Alt. 3600 ~ 4000 m.

Specimens examined CHINA: S Xizang: Tsari, Ludlow & Sherriff 2042(BM, E); Gerda, 3600 m, C. W. Wang 65940(GH); Kangding, L. Shu 1118(PE). Yunnan: Lichiang, 3600 m, G. Forrest 6399(P), 4600 m, J. Rock 9912(US); Atuntze, Bei ma shan, 4050 m, T. T. Yu 9351(KUN), 10756(E, GH); *ibid.*, C. W. Wang 69424(GH); Chungtien, 3600 m, T. T. Yu 13733(GH). Sichuan: Muli, Mt. Kulu, J. Rock 18193(E, P, W, US); *ibid.*, Wachin, Jin-chang, 3700 m, T. T. Yu 14560(E, GH); Dawu (Daofu), W. P. Wang & W. G. Hu 10957(PE).

Subsect. 2. *Annui* Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 183. 1983, p.p.

Flowers pentamerous, tetramerous or even trimerous; calyx small, narrow, tubular, shallowly to deeply lobed; hairs simple; corolla narrow, tubular, blue.

20. *Cyananthus inflatus* Hook. f. et Thomson in J. Linn. Soc. London(Bot.) 2: 21. 1858; C. B. Clarke in Hook. f, Fl. Brit. Ind. 3: 435. 1881; Franch. in J. Bot. (Paris) 1: 281. 1887; C. Marq. in Kew Bull. 1924: 249. 1924; Hara, Enum. Fl. Pl. Nepal 3: 52. 1982; Y. S. Lian in Fl. Reip. Pop. Sin. 73(2): 26. 1983; D. Y. Hong & L. M. Ma Acta Phytotax. Sin. 29: 49. 1991. — *Cyananthus pseudo-inflatus* Tsoong, Contrib. Inst. Bot. Nat. Acad. Rep. 3: 109. 1935. — *Cyananthus forrestii* Diels in Notes Roy. Bot. Gard. Edinb. 5: 173. 1912. (Fig. 26)

Sikkim: J. Hooker s. n. (lectotype(here designated)! P; isoelectotypes! BM, FI, K, NY, W).

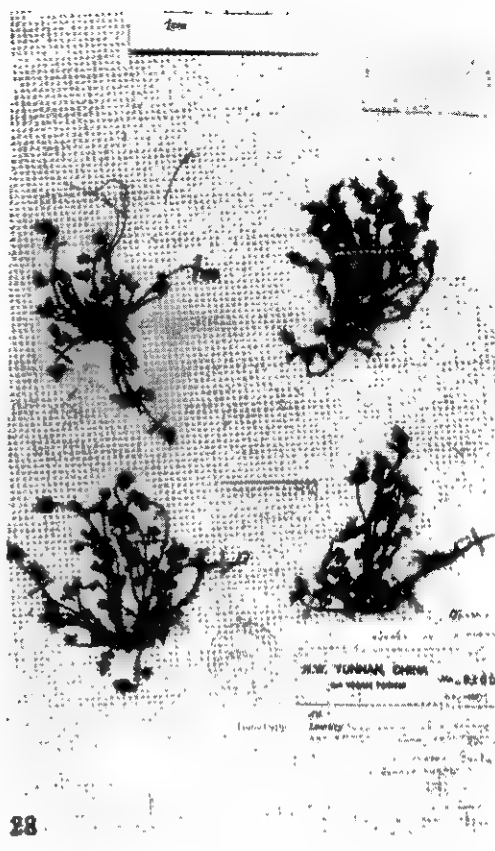
A prostrate annual herb; 5 ~ 80 cm long. Stems filiform with spreading branches; branches zig-zag, moderately leafy, glabrous to moderately pubescent. Leaves scattered, petiolate, petiole 0.2 ~ 2.5 cm long; leaf blades round or suborbicular, 0.5 ~ 1.7 × 0.5 ~ 1.2 cm; sinuate, entire to undulate, crenate; topmost ones somewhat like involucre bracts. Flowers imperfectly 5-merous, rarely(3)4-merous; solitary, terminal; pedicel 0.1 ~ 0.7 cm long, moderately pubescent. Calyx swollen(inflated) at base, 0.7 ~ 1.2 × 0.5 ~ 1.0 cm, very shortly lobed; lobes 0.1 ~ 0.2 cm long, triangular, acute at apex; moderately pubescent(specimens from Yunnan densely hairy). Corolla blue(rarely half blue, half yel-

low), cylindrical, 1.0~1.7 cm long, lobes short, $0.3 \sim 0.6 \times 0.15 \sim 0.25$ cm, oblong, villous at throat. Capsule broadly conical to globose, inflated; valves exerting the calyx, recurved and acuminate.

Distribution Nepal, India(N & W Bengal, Sikkim, Assam), Bhutan, N Myanmar, China(Xizang, Yunnan, Sichuan). Alt. 2500~4800 m.

Specimens examined NEPAL: Central Nepal: Ramechhap, Fogtey, 3000 m, M. Banerjee, K. Shrestha & A. Upadhyaya 2900(KATH, US); Gorkha, Barpak, 4800 m, L. Dhwoj 83(BM, E); Bimtakothi, 4100 m, D. Lowndes 1457(BM); Rasuwa, Chandanbari, 3450 m, K. Shrestha 111(KATH, LE); Ganjala, 5000 m, O. Polunin 1971(BM); S Ganesh Himal, Turu danda, 3600 m, J. Stainton 5102(BM, KATH). E Nepal: Topke gola, 4000 m, Beer, Lancaster & Morris 10772(BM); Khumbu, Kunde, 4200 m, A. Horsfall 9(BM); Wolangchung gola, J. Hooker, 250(syntype, K!); ibid., Kanata, Murata & Togashi 6300383(KATH, BM). INDIA: N Bengal: Darjeeling, Singalelah, 3600 m, C. B. Clarke 12721(LE). W Bengal: Phallut, V. Haridassan 205(US); Phalute, 3950 m, K. Biswas, s.n.(NY, US); Rechila, 3300 m, H. Haines 2005(K). SIKKIM: Jongri, 4000 m, C. B. Clarke 25851(BM, K, LE); Jakpho, 3300 m, C. B. Clarke 41322(BM, FI, K, LE); Na thuli la, 4600 m, R. Cooper 609(E); Phedang, 4050 m, Starling, Cunningham *et al.* 398(K); Nambranthang, 4600 m, Ribu & Rohmoo 5860(K, E). ASSAM: Ze la, 4600 m, F. K. Ward 14133(BM). BHUTAN: 3600~5250 m, Griffith 1771(syntype! K); Pumthang, 3600 m, R. Cooper 2137(BM); Tolegong, 4600 m, R. Cooper 2212(BM, E); Punakha, Sinchula, 3600 m, Bowes Lyon 5074(BM); Thimpu-Punakha, 3480 m, Bigger 2979(E); near Thampa la, 4600 m, Ludlow, Sherriff & Hicks 17192(BM, E); Upper Mo chu district, 2850 m, Sinclair & Long 5037(K). MYANMAR: N Myanmar: Mindat, 2800 m, U. Gale 9162(E); Trawaddy adjung Valley, F. K. Ward 9988(BM). W Central Myanmar: Mt. Victoria, 2900 m, F. K. Ward 22779(BM). CHINA: Xizang: Chumbi, R. Cooper 747(E); Near Phari, 4600 m, B. Gould 1602(K); Kongbo Tripe Valley, 4300 m, Ludlow, Sherriff & Elliott 14497(BM, E); Tsari, 4500 m, Ludlow, Sherriff & Taylor 6371(BM, E); Nambu la, 4400 m, Ludlow, Sherriff & Taylor 6949(BM); Tumbatase, 3400 m, F. K. Ward 6209(BM, E, K). Yunnan: Tali, Mt. Tsang-chan, M. Delavay 146(K, LE, P, US); ibid., 3300 m, C. Schneider 2693(GH, K, US); E Chungtien, K. M. Feng 2298(GH); N Haba, K. M. Feng 2370(GH); E Lichiang, 4000 m, G. Forrest 6695(BM, E, K, P); Atuntze, 4100 m, T. T. Yu 10756(BM); Ducloux 516(P); Tengyueh, E. Howell 147(K, E); Chu-Hsiung, Kan-mo, 2500 m, M. G. Li 205(KUN). Sichuan: Tachienlu, 3000 m, W. P. Fang 5360(GH, US,); Muli, Kulu, 4300 m, J. Rock 18193(K, W); Huili, 3300 m, Handel-Mazzetti 5171(E). Guizhou: Weining, Y. Tsiang 9126(NY).

21. *Cyananthus fasciculatus* C. Marq. in Kew Bull. 1924:247. 1924; Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 26. 1983; D. Y. Hong & L. M. Ma in Acta

Fig. 27 *Cyananthus fasciculatus* (Isotype, US)Fig. 28 *Cyananthus cronquistii* (Holotype, E)

Phytotax. Sin. 29: 49. 1991. — *Cyananthus inflatus* var. *sylvestris* C. Marq. in Kew Bull. 6: 249. 1924, syn. nov. (Fig. 27)

NW Yunnan, China: NW flank of Lichiang range, 3660 m; G. Forrest 22485 (holotype! K; isotypes! BM, E, P, US, W).

Annual prostrate herbs. Stems up to 70 cm long, branchlets spreading and glabrous. Leaves petioled, petiole 0.3–0.8 cm long; leaf-blades obovate-spathulate, 0.5–1.5 × 0.6–1.2 cm, nearly glabrous; entire to undulate crenate. Flowers 3–5 fascicled at the apex of leafy branches, short-peduncled, peduncle 0.1–0.4 cm long, glabrous. Calyx tubular, 0.7–1.0 × 0.3–0.5 cm long, moderately pilose; divided up to the middle; lobes 0.3–0.5 cm long, narrowly lanceolate. Corolla pale, dark blue at the base, tubular, 1.0–2.0 cm long; lobed to one third of its length, lobes 0.4–0.7 × 0.2–0.3 cm, obtuse at apex. Capsule scarcely inflated, valves exerting the calyx.

Distribution China (Yunnan, Sichuan). Alt. 2400–3500 m.

Specimens examined CHINA: Yunnan: Lichiang, J. Rock 10879 (BM, US, NY); ibid., 4100 m, G. Forrest 11682 (BM, E, P, NY); Chungtien, 3400 m, C. Schneider 3712 (GH, K, US), 3600 m, T. T. Yu 13775 (GH); Wen-feng-tze, R. C. Ching 21817 (GH); N Haba snow range, K. M. Feng 2376 (GH). Sichuan: Muli, 4000 m, G. Forrest

28385(E); between Yenyuen & Yalung, H. Handel-Mazzetti 5411(W); Yien-pien Hsien, 2600 m, T. T. Yu 1705(GH); Lixian, W. P. Fang *et al.* 14136(PE).

Subgen. 2. *Micranthus* K. Shrestha, subgen. nov.

Type: *Cyananthus hookeri* C. B. Clarke

Herbae annuae humiles suberectae. Flores tetrameri sessiles subinconspicui.

Annual, suberect dwarf herbs. Flowers small, sessile, tetramerous; corolla sub-campanulate.

22. *Cyananthus cronquistii* K. Shrestha in Kew Bull. 49(1):143~147. — *Cyananthus hookeri* var. *levicaulis* Franch. in J. Bot. (Paris), 1: 201. 1887. — *Cyananthus hookeri* var. *grandiflorus* C. Marq. in Kew Bull. 1924: 249. 1924. — *Cyananthus hookeri* var. *levicalyx* Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 27. 1983. (Fig. 28)

NW Yunnan, China: Atuntze, Forrest 20165(holotype! E; isotype! K, US, W).

Dwarf semiprostrate annual herbs, 5~10(~15) cm high. Stems glabrous. Leaves petiolate; leaf blades obovate-spathulate, 4~6(~8) × 2~4(6) mm, cuneate, decurrent into a petiole 1~1.5 mm long at base, obtuse at apex, glaucous to sparsely minutely hairy, margin undulate. Inflorescence a polychasial cyme, usually at the tips of axillary and terminal branches. Flowers sessile, subtended by persistent leafy bracts, nearly campanulate. Calyx(3~)4(~5)-merous, glabrous to sparsely minutely hairy, lobes 2~3 mm long, acute, margin ciliate. Corolla (3~)4(~5)-merous, deep blue, hairy at throat, 8~10 mm long, lobes oblong, 4 × 1.6 mm. Stamens 4, alternating with corolla lobes, anthers subcordate. Stigma 4-lobed, filamentous; style long and slender. Capsule(3~)4(~5)-valved, exceeding the persistent calyx. Seeds numerous, small, 0.75 × 0.35 mm, ellipsoidal and brown.

Distribution China(Yunnan). Alt. 4100~4750 m.

Specimens examined CHINA: Yunnan: NE Atuntze, 28°35'N, 99°10'E, 4750 m, 1921-09, G. Forrest 20165(holotype, E; isotypes, K, US, W); Atuntze, Bei-ma-shan, 3400 m, 1935-09, C. W. Wang 70134(GH), 4100 m, 1937-11-14, T. T. Yu 10762(BM, GH); Mekong-Yangtze divide, Bei-ma-shan, G. Forrest 13223(BM, E); Doker la. Mekong-Salween divide, 28°20'N, 4250 m, 1917-08, G. Forrest 14674 (BM, E, K); Lichiang snow range, 1939-10-08, R. C. Ching 30722(GH).

23. *Cyananthus hookeri* C. B. Clarke in Hook. f, Fl. Brit. Ind. 3: 435. 1881; Franch. in J. Bot. (Paris) 1:281. 1887; C. Marq. in Kew Bull. 1924: 248. 1924; Hara, Enum. Fl. Pl. Nepal 3: 51. 1982; Y. S. Lian in D. Y. Hong, Fl. Reip. Pop. Sin. 73(2): 27. 1983; D. Y. Hong & L. M. Ma in Acta Phytotax. Sin. 29: 49. 1991 — *Cyananthus hookeri* var. *hispidus* Franch. in J. Bot. (Paris) 1: 201. 1887. — *Cyananthus hookeri* var. *densus* C. Marq. in Kew Bull. 1924: 249. 1924. (Fig. 29)

E Nepal: Wolangchung, 4300 m; J. Hooker 249(holotype! K; isotype! P).

A low annual ephemeral herbs. Stems many, 5~25 cm, ascending, rigid with short



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Fig. 26 *Cyananthus inflatus* (Isolectotype, W)

lateral flowering branches, lateral branches 0.6 ~ 2.5 cm long; moderately pubescent. Leaves petioled, petiole 0.1 ~ 0.3 cm long, winged and ciliate; leaf blades ovate, 0.4 ~ 0.8 × 0.3 ~ 0.7 cm, hirsute. Flowers sessile, solitary, terminal, subtended by leafy bracts. Calyx cylindrical, 0.4 ~ 0.7 × 0.3 ~ 0.5 cm, densely clothed with long, stiff whitish hairs (changing to yellowish); lobed to one third of its length; lobes 0.15 ~ 0.25 cm, triangular. Corolla blue, cylindrical to subcampanulate, 0.7 ~ 1.3 cm long; lobed to one third of its length, lobes 0.25 ~ 0.4 × 0.15 ~ 0.2 cm, oblong. Capsule conical, 0.5 × 0.4 cm, (3)4(5)-valved, included in the calyx.

Distribution Nepal, India (Sikkim), Bhutan, China (Xizang, Yunnan, Sichuan, Qinghai, Gansu). Alt. 2750 ~ 4900 m.

Specimens examined NEPAL: W Nepal: Mugu, 4100 m, O. Polunin, W. Sykes & L. Williams 5334 (BM). Central Nepal: Bimtakothi, 4100 m, D. Lowndes 1462 (BM); Beding, Rolwaling khola, 3600 m, H. Ohba *et al.* 8331753 (E); Rasuwa, between Sherpa-gaon & Langtang, 3000 m, D. Nicolson 2550 (BM, KATH, US); Rasuwa, Kyan-



29

Fig. 29 *Cyananthus hookeri* (Holotype, K)

jinghyang, 4300 m, O. Polunin 1766 (BM); Chandanbari, 3400 m, K. Shrestha 146 (KATH, LE). E Nepal: Khumbu, S Namche, 3150 m, de Haas 2946 (BM); Pheriche, Khumbu, 4800 m, A. Horsfall 53 (BM); Makalu, Upper Barun Valley, 4950 m, T. Wraber

Table 1 Phytogeography of the Genus *Cyananthus*

Names of Species	India		Nepal			Sikkim	Myanmar (Burma)	Bhutan	China					Altitude(m)					
	Punjab	Kumoon-Garhwal	Assam	W. Nepal	C. Nepal				E. Nepal	Xizang	Yunnan	Sichuan	Qinghai	Gansu	2000-2500	2500-3000	3000-3500	3500-4000	4000-4500
1. <i>Cyananthus cordifolius</i> Duthie	+		+					+									+	+	
2. <i>C. cronquistii</i> K. Shrestha									+								+	+	
3. <i>C. delavayi</i> Franch.									+	+						+	+		
4. <i>C. dolichosceles</i> C. Marq.								+		+						+	+	+	+
5. <i>C. fasciculatus</i> C. Marq.									+	+					+	+			
6. <i>C. flavus</i> C. Marq.																			
subsp. <i>flavus</i>									+							+			
subsp. <i>montanus</i> (C. Y. Wu) D. Y. Hong & M. L. Ming									+	+					+	+			
7. <i>C. formosus</i> Diels									+	+						+	+	+	+
8. <i>C. hayanus</i> C. Marq.					+												+	+	+
9. <i>C. himalaicus</i> K. Shrestha					+												+		
10. <i>C. hookeri</i> C. B. Clarke				+	+	+	+	+	+	+	+	+	+			+	+	+	+
11. <i>C. incanus</i> Hook. f. & Thomson																			
subsp. <i>incanus</i>					+	+	+	+	+	+		+	+			+	+	+	+
subsp. <i>orientalis</i> K. Shrestha					+	+	+	+	+	+							+	+	
subsp. <i>petiolatus</i>									+		+						+	+	+
12. <i>C. inflatus</i> Hook. f. & Thomson			+	+	+	+	+	+	+	+	+				+	+	+	+	+
13. <i>C. integer</i> Wallich ex Benth		+														+			
14. <i>C. leiocalyx</i> (Franch.) Cowan							+		+	+						+	+	+	+
15. <i>C. lichiangensis</i> W. W. Smith									+	+	+						+		
16. <i>C. lobatus</i> Wallich ex Benth	+		+	+	+	+	+	+	+	+					+	+	+	+	+
17. <i>C. longiflorus</i> Franch.										+						+	+	+	
18. <i>C. macrocalyx</i> Franch.																			
subsp. <i>macrocalyx</i>									+	+	+	+	+		+	+	+	+	+
subsp. <i>spathulifolius</i> (Nannf.) K. Shrestha				+	+	+	+	+	+	+		+	+				+	+	+
19. <i>C. microphyllus</i> Edgew.	+	+		+	+	+			+								+	+	+
20. <i>C. pedunculatus</i> C. B. Clarke				+	+	+	+	+	+								+	+	+
21. <i>C. pilosus</i> (C. Marq.) K. Shrestha									+	+						+	+		
22. <i>C. sherriffii</i> Cowan									+								+	+	+
23. <i>C. wardii</i> C. Marq.									+								+	+	+

206 (BM). SIKKIM: R. Lepcha 7690 (E); Kakula, 5200 m, Ribu 2782 (E). BHUTAN: Pumthang, Lhabje, 4100 m, R. Cooper 2180 (BM, E); Thimpu, Linghi, 4300 m, R. Cooper 3500 m (BM); Thanga, Upper Pho chu, 4300 m, Ludlow, Sherriff & Hicks 17260 (BM); Upper Mo chu district, 3990 m, Sinclair & Long 5146 (E, K); Bumthang chu,

Shimitang, 3600 m, LSH 19682(BM). CHINA: Xizang: Lhasa, F. Chapman 750(K); Yatung, H. Hobson, s. n. (K); Chumbi, G. King's collector 182(K); Bimbi la Tsari, 4600 m, Ludlow & Sherriff 2546(BM); Kongbo, Nyoto sama, 4000 m, Ludlow, Sherriff & Elliott 15624(BM); Upper Tason Valley, 4000 m, F. K. Ward 10047(BM); Kungpu Changta, 4100 m, Qinghai-Tibet Brigade 7384(KUN, PE). Yunnan: Haba snow range, K. M. Feng 2359(GH); Chungtien, 4000 m, H. Handel-Mazzetti 7714(K, W); E Chungtien, K. M. Feng 2296(GH); Lichiang, 4300 m, G. Forrest 6648(BM, K, E); Atuntze, 2700 m, C. W. Wang 69916(GH); Atuntze, Beima shan, 3900 m, T. T. Yu 10826(BM, GH). Sichuan: Sungpan Hsien, W. P. Fang 4472(K, E, GH, US); Tachienlu, R. Mussot 253(P); Near Tachienlu, between 2700~4000 m, A. Pratt 454(BM, K); Tongolo, J. Soulie 672(K, P). Gansu: Taochow, 4200 m, R. C. Ching 875(US); Tao River basin, Mt. Kwang kei, 4050 m, J. Rock 13725(E, GH, K, NY, US).

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